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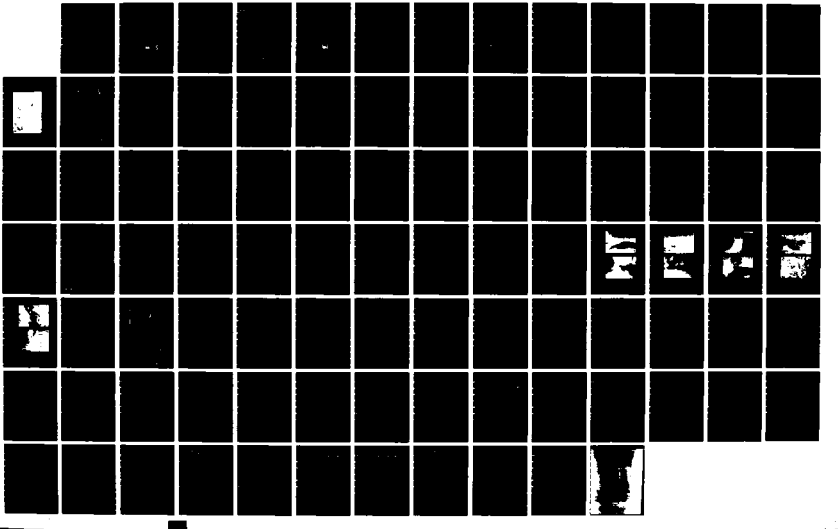

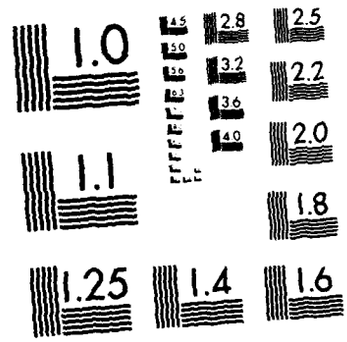

CONNECTICUT RIVER BASIN
NEW HARTFORD, CONNECTICUT

LAUREL LAKE DAM
CT 00372

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

SEPTEMBER, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00372	2. GOVT ACCESSION NO. A144062	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Laurel Lake Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE September 1980 13. NUMBER OF PAGES 55
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16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
New Hartford, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Laurel Lake Dam is an earth embankment built about 1965 and impounding an unnamed tributary to Morgan Brook in New Hartford. The dam is approximately 595 feet long, 10 feet wide at the top, 27 feet high and has a maximum impoundment of 176 acre-feet. Laurel Lake Dam is classified as a significant hazard, small size dam. The test flood range is from the 100 year storm to one-half the PMF. Based upon the visual inspection at the site and past performance of the dam, the project is judged to be in poor condition.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

DEC 19 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Laurel Lake Dam (CT-00372) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Mountain Laurel Development Corp., West Hartford, Conn.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

Incl
As stated

CONNECTICUT RIVER BASIN
NEW HARTFORD, CONNECTICUT

LAUREL LAKE DAM
CT 00372

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

SEPTEMBER, 1980

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	LAUREL LAKE DAM
Inventory Number:	CT 00372
State Located:	CONNECTICUT
County Located:	LITCHFIELD
Town Located:	NEW HARTFORD
Stream:	UNNAMED TRIBUTARY TO MORGAN BROOK
Owner:	MOUNTAIN LAUREL DEVELOPMENT CORPORATION
Date of Inspection:	MAY 9, 1980, June 3, 1980
Inspection Team:	PETER HEYNEN, P.E.
	JAY COSTELLO
	JEFFREY O. BORNE
	MURALI ATLURU, P.E.
	MIRON PETROVSKY
	TIMOTHY KAVANAUGH

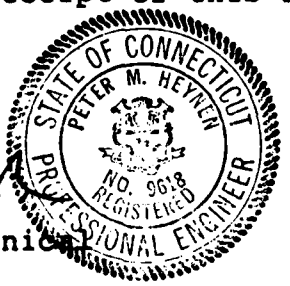
The Laurel Lake Dam is an earth embankment built about 1965 and impounding an unnamed tributary to Morgan Brook in New Hartford, Connecticut. The dam is approximately 595 feet long, 10 feet wide at the top, 27 feet high and has a maximum impoundment of 176 acre-feet. The spillway is a 40 ft. long unlined earth channel located at the left end of the dam. A 24 inch cast iron drop inlet pipe is located approximately 10 feet upstream from the central portion of the dam. A 30 inch x 30 inch steel frame structure with removable boards is used to control the lake level. No low-level outlet was found at the dam. The outlet is a 24 inch concrete pipe. The slopes and top of the dam are densely vegetated with brush and tree saplings. A footpath extends the entire length of the dam crest.

In accordance with the Army Corps of Engineers Guidelines, Laurel Lake Dam is classified as a significant hazard, small size dam. The test flood range is from the 100 year storm to one-half the Probable Maximum Flood (½ PMF). The test flood for Laurel Lake Dam is selected as the ½ PMF. Peak inflow to the impoundment is 350 cfs; peak outflow is 240 cfs with the dam maintaining 0.75 feet of freeboard. Based upon hydraulic computations, the spillway capacity is 410 cfs, which is greater than 100% of the routed test flood outflow.

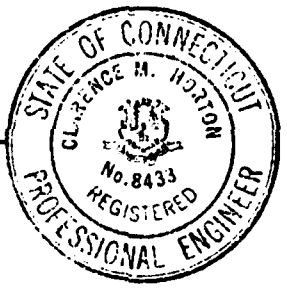
Based upon visual inspection at the site and past performance of the dam, the project is judged to be in poor condition. There are areas requiring maintenance, monitoring and repair such as seepage, embankment repair, lack of proper spillway protection and vegetation on the embankment.

It is recommended that the owner initiate further studies, to be performed by a registered professional engineer. These should include inspection of the drop inlet, 24 inch concrete outlet pipe, and conduit through the embankment; providing a means of lowering the lake level in case of emergencies at the dam; repair of the spillway; implementation of a geotechnical investitation program to determine embankment and foundation conditions; an investigation of the seeps at the toe of the embankment and preparation of "as-built" drawings for future reference.

It is recommended that the seepage at the dam be investigated immediately upon the owner's receipt of the report. All other recommendations and remedial measures should be instituted with one (1) year of the owner's receipt of this report.



Peter M. Heynen, P.E.
Project Manager - Geotechnical
Cahn Engineers, Inc.



C. Michael Horton, P.E.
Department Head
Cahn Engineers, Inc.

This Phase I Inspection Report on Laurel Lake Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

The information contained in this report is based on the limited investigation described above and is not warranted to indicate the actual condition of the dam. The integrity of the dam can only be determined by a means of a monitoring program and/or a detailed physical investigation. The accuracy of available data is assumed where not in obvious conflict with facts observable during the visual inspection.

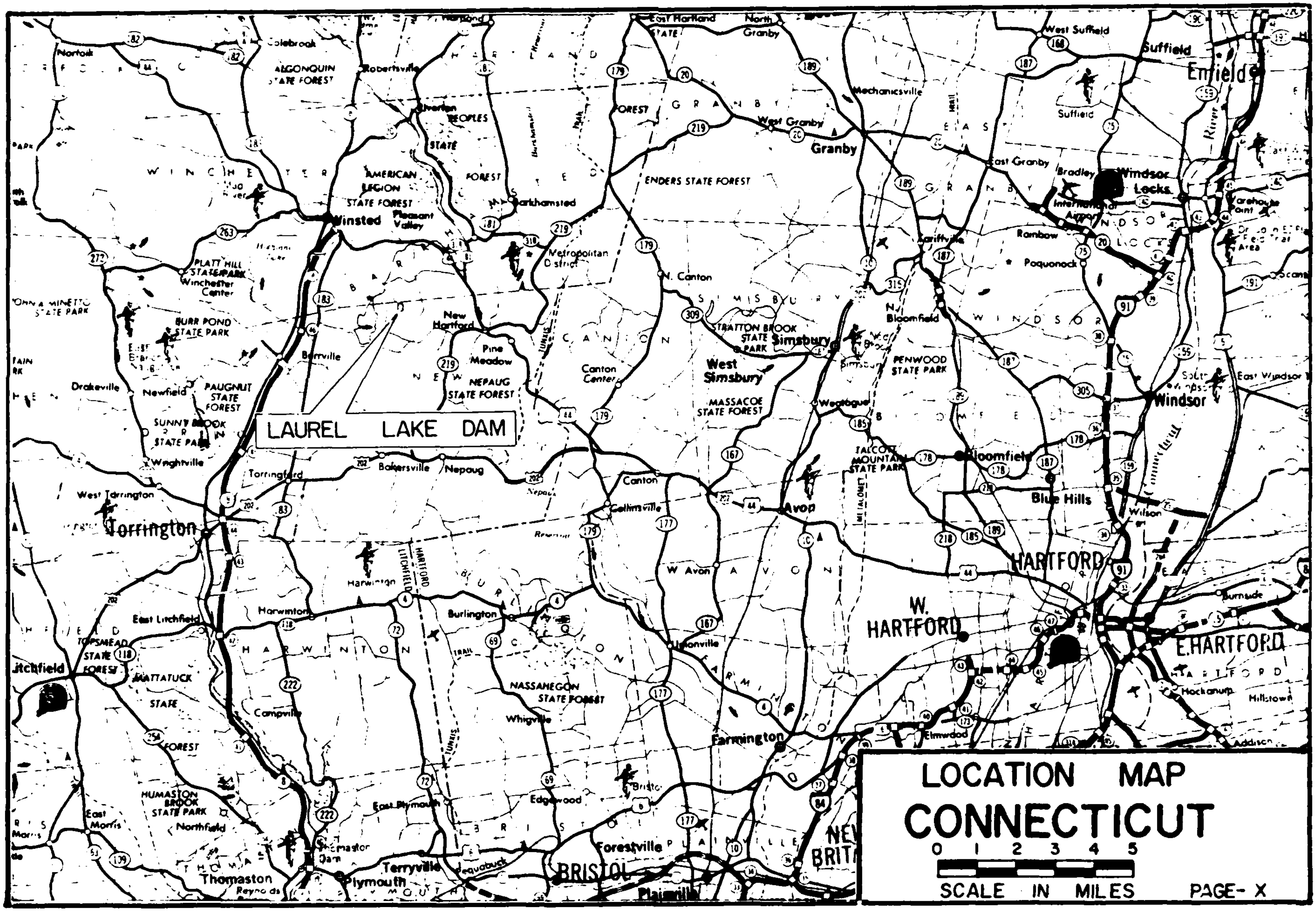
TABLE OF CONTENTS

SECTION 7: ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

APPENDICES

OVERVIEW PHOTO
(May, 1980)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS. CAHN ENGINEERS INC. WALLINGFORD, CONN ENGINEER	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	Laurel Lake Dam TR-Morgan Brook	New Hartford CONNECTICUT	DATE Sept. 1980 CE # 27 785 KE PAGE ix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Winsted
Simsbury
Granby
Avon
Farmington
HARTFORD
W. HARTFORD
E.HARTFORD
Windsor
Windsor Locks
Enfield
Suffield
BRISTOL
Plymouth
Terryville
Thomaston
Litchfield
LOCATION MAP
CONNECTICUT
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SCALE IN MILES
PAGE- X

PHASE I INSPECTION REPORT

LAUREL LAKE DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, autnorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of April 14, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0052 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report passes judgment only on those factors of safety and stability which can be determined by a visual surface examination. The inspection is to identify those visually apparent features of the dam which evidence the need for corrective action and/or further study and investigation.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on an unnamed tributary to Morgan Brook (Connecticut River Basin) in a suburban area of the town of New Hartford, County of Litchfield, State of Connecticut. The dam is shown on the Winsted USGS Quadrangle Map having coordinates latitude N41°53.2' and longitude W73°01.1'.

b. Description of Dam and Appurtenances - The dam is 595 feet in length, 27 feet high and is of earth fill construction. The spillway is located at the left end of the dam and the outlet is at the central portion of the embankment. All elevations are based on an assumed datum (spillway crest = 100.0) and are not N.G.V.D. elevations

The top of the dam is typically 10 feet wide and has a minimum elevation of 103.3, which is 3.3 feet above the spillway crest. A well used footpath extends the length of the top of the dam. The upstream slope inclination is 1.5 horizontal to 1 vertical and is entirely covered with weeds and tree saplings. Dumped riprap, extending below elevation 101 (approximately 2 feet below the top of slope) stabilizes the slope below the water level. The downstream slope is also vegetated with weeds and small trees. The slope is inclined at approximately 1.5 horizontal to 1 vertical.

The spillway is located to the far left end of the dam. It is a 40 foot wide unlined sand and gravel channel extending along the left abutment to the original streambed. The spillway "crest" is at elevation 100.0, leaving approximatley 3 feet of freeboard. Except during very high discharge, water is released through a smaller (5± feet wide) stream at the right side of the spillway (See Sheet B-1, Photo 4). The spillway has no definite shape and no riprap protection at the crest or in the discharge channel.

The intake structure is located about 10 feet from the upstream slope of the dam, approximately 210 feet from the right end. It consists of a 24 inch cast iron drop inlet pipe and a 30 inch by 30 inch steel frame with wooden boards (Photo 5). At the present time there are five, 8 inch boards totaling 40 inches in height. These boards are tongue and groove, and can be removed. The top of the upper-most board is approximately elevation 101.9 and the overflow elevation with all boards removed is approximately 98.6.

The outlet consists of a 24 inch concrete pipe, (invert elevation 76.3) located at the central portion of the toe of the embankment (Photo 3). The discharge channel appears to be the natural channel of the original stream. The size and configuration of the conduit between the inlet and outlet structures is assumed to be a 24 inch concrete pipe. There is no low-level outlet at the dam.

c. Size Classification - SMALL - The dam impounds 176 acre-feet of water with the lake level at the top of the dam, which at elevation 103.3, is 27 feet above the original streambed. According to the Recommended Guidelines a dam with this height and available storage capacity is classified as small in size.

d. Hazard Classification - SIGNIFICANT - If the dam were breached, there is potential for loss of less than a few lives at a house located 3,800 feet downstream and 4± feet above the streambed. Upon failure of the dam, this house would be inundated by 1.4± feet of water, Bsullak Road would be inundated by 3.4± feet of water causing considerable damage, and a culvert and embankment for East-West Hill Road would be impacted farther downstream.

e. Ownership - Mountain Laurel Development Corp.
Bishop Corner, West Hartford, Conn.
Mr. Isadore Case, President
(203) 242-7745

f. Operator - Same as owner, above.

g. Purpose of Dam - According to the owner, the dam was built about 1965 to provide a lake for a fish and game club. The present owner acquired the property about 1973 to develop the lake front property for residential construction.

1.3 PERTINENT DATA

a. Drainage Area - 0.27 square miles of gently rolling, wooded, rural terrain (located in the Connecticut River Basin) with new suburban development close to the lake.

b. Discharge at Damsite - Normal discharge is over the spillway and through the ungated drop inlet. Elevations are based on assumed datum, spillway crest = 100.0.

1. Outlet Works (conduits):	
24" cast iron drop inlet pipe to 24 inch concrete @ d/s invert El. 76.3:	70 cfs (water level to top of dam)
2. Maximum flood @ damsite:	Unknown
3. Ungated spillway capacity @ top of dam el. 103.3:	410 cfs
4. Ungated spillway capacity @ test flood el. 102.55:	240 cfs
5. Gated spillway capacity @ normal pool:	N/A
6. Gated spillway capacity @ test flood:	N/A
7. Total spillway capacity @ test flood el. 102.55:	240 cfs
8. Total project discharge @ top of dam el. 103.3:	410 cfs
9. Total project discharge @ test flood el. 102.55:	240 cfs

c. Elevations - (Elevations are not NGVD. All elevations based on an assumed datum; spillway crest = 100.0)

1. Streambed at toe of dam:	76.3
2. Bottom of cutoff:	N/A
3. Maximum tailwater:	Unknown
4. Normal pool:	100.0
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	100.0
7. Design surcharge (original design):	Unknown
8. Top of dam:	103.3
9. Test flood surcharge:	102.55

d. Reservoir (Length in feet)

1. Normal pool:	1500 ft.
2. Flood control pool:	N/A
3. Spillway crest pool:	1500 ft.
4. Top of dam:	1600 ft.
5. Test flood pool:	1550 ft.

e. Storage (acre-feet)

1. Normal pool:	118 acre-ft.
2. Flood control pool:	N/A
3. Spillway crest pool:	118 acre-ft.
4. Test flood pool:	160 acre-ft.
5. Top of dam:	176 acre-ft.

f. Reservoir Surface

1. Normal pool:	15 acres
2. Flood control pool:	N/A
3. Spillway crest:	15 acres

4. Test flood pool:	18 acres
5. Top of dam:	20 acres

g. Dam

1. Type:	Earth embankment
2. Length:	595 ft.
3. Height:	27 ft.
4. Top width:	10 ft.
5. Side slopes:	1.5 H to 1 V Upstream 1.5 H to 1 V Downstream
6. Zoning:	Not known
7. Impervious core:	N/A
8. Cutoff:	N/A
9. Grout curtain:	N/A
10. Other:	N/A

h. Diversion and Regulatory Tunnel - N/A

i. Spillway

1. Type:	unlined earth channel
2. Length of weir:	40 ft.
3. Crest elevation:	100.0
4. Gates:	N/A
5. U/S Channel:	sand and gravel, gently sloping
6. D/S Channel:	Highly vegetated, boulder filled channel
7. General:	Non-structural

j. Regulating Outlets - The only outlet is a 24 inch drop inlet, which discharges via a 24 inch concrete pipe outletting at the toe of the downstream slope.

1. Invert:	76.3 downstream 98.6± upstream (no boards) 101.9± upstream (five 8 inch boards)
2. Size:	24" conduit

3. Description:	24 inch cast iron drop inlet pipe to concrete pipe through embankment
4. Control Mechanism:	30" x 30" steel frame with removable boards. Boards are five, 8 inch tongue and groove boards totaling 40 inches high.

SECTION 2: ENGINEERING DATA

2.1 DESIGN DATA

No design data or design plans are available for the original design of the dam.

2.2 CONSTRUCTION DATA

There is no data or construction inspection reports available for the original construction of the dam.

2.3 OPERATION DATA

No formal operation records are known to exist nor are lake level readings known to be taken on any regular basis. The only available information is correspondence between the State of Connecticut and the owner (Mountain Laurel Development Corp.) and an inspection report done by S.E. Minor and Company, Civil Engineers, in 1975. These are presented in Appendix B.

2.4 EVALUATION

Existing data was provided by the State of Connecticut and verbally by the owner, who also made the premises available for visual inspection. The limited amount of detailed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the assessment of this dam must be based on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements. A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - Based upon visual inspections performed on May 9 and June 3, 1980, the dam is considered to be in poor condition. The inspections revealed areas requiring maintenance, monitoring and repair. The reservoir level was at elevation 100.2 with a small amount of flow over the spillway.

b. Dam

Top of Dam - The top of dam is covered with brush and small trees except for a narrow, well worn, footpath extending the entire length of the dam. The vegetation consisted mostly of tree saplings 10-12 feet tall and 1-2 inches maximum diameter (Photos 1 and 2, Overview). No washouts, sloughing or depressions were noted on the crest.

Upstream Slope - The upstream slope is also heavily vegetated and has dumped riprap present below elevation 101± (Photo 1). No sloughing, washouts, or depressions were noted although some erosion from trespassing is present where paths lead to the edge of water (Photo 6). The riprap is in fair condition with some areas of displacement.

Downstream Slope - The downstream slope has a heavy vegetative cover of small trees and brush (Photo 3) with a footpath extending from the top of the dam to the toe at the central portion of the slope. Seepage totalling more than 20 gpm was noted all along the toe of the dam with the most seepage occuring at the central portion of the dam (Photo 8). A large swampy area with several pools of stagnant water was observed along the toe of the dam in the same area as the seeps (Photo 7). Some "holes" at the right end of the dowstream slope were observed about 8 feet below the top of dam (Photo 9). These areas apparantly are not related to the seepage and appear to have been dug out to approximately 2 feet in depth and 3-4 feet in diameter to remove some boulders or tree stumps.

Spillway - The spillway is an unlined channel of irregular shape extending along the left abutment. The channel is filled with various debris and heavy vegetation (Photo 4). Water discharges through a smaller "natural" stream at the right side of the channel. Some small mounds of earth have been placed from the left side of the channel to this stream, allowing water over the earth mounds only during times of high discharge (See Sheet B-1). No riprap was observed at any part of the spillway. The approach channel is gently sloped, sand and gravel material.

c. Appurtenant Structures

Intake Structure - The intake structure is a 24 inch cast iron drop inlet pipe and a steel framed structure with wooden boards to control the lake level. (Photo 5). It is located approximately 10 feet upstream from the top of the slope. Some wood and boulders were noted at the base of the drop inlet. No low-level outlet for lowering the pond was found during the inspection.

Outlet Structure - The outlet structure is a 24 inch concrete pipe located at the toe of the downstream slope (Photo 3). There was flow from the outlet at the time of the inspection.

d. Reservoir Area - The area surrounding the reservoir is rural, rolling and wooded. Low density (± 1-2 acre) lake front residential building lots are being sold and developed around Laurel Lake.

e. Downstream Channel - The downstream portion of the outlet channel is the natural channel of the original streambed. Debris and overhanging trees were observed during the inspection (Photo 10).

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being in poor condition. The following features which could influence the future condition and/or stability of the dam were identified.

1. Erosion areas with riprap displacement on the upstream slope caused by access paths, could present stability problems should the dam be overtopped.

2. Dense, immature, woody vegetation covering the entire dam will result in root penetration which will present stability problems by providing seepage paths along root systems and weakening the embankment should trees blow over during strong winds.

3. Seepage along the downstream slope could result in dam instability if a program to study and monitor seepage is not implemented.

4. The unstabilized, earthen spillway does not have adequate protection to prevent erosion during flows which the spillway is expected to experience.

5. There is no access bridge to the drop inlet, making it impossible to reach the inlet during high lake levels. The present system of removing boards to increase discharge through the drop inlet would be quite difficult during periods when water is flowing over the boards.

6. There is no low-level outlet or means to draw down the lake in case of emergencies at the dam.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - There are no formal operating procedures known to exist. No lake level readings are taken, nor is the drop inlet adjusted to vary the flows or lake level. The dam was inspected by S.E. Minor and Company, Incorporated in 1975.

b. Description of Any Formal Warning System in Effect -No formal warning system is in effect.

4.2 MAINTENANCE PROCEDURES

a. General - There is no formal maintenance program for the dam or operating facilities. The owners reported that they have recently contracted to have the vegetation cut and the spillway riprapped, however no evidence of repair was found at the inspection. No repairs are known to have been done after the 1975 inspeciton by S.E. Minor and Company, Inc.

b. Operating Facilities - No maintenance is known to be performed for the drop inlet structure and outlet facilities.

4.3 EVALUATION

The operation and maintenance procedures are poor. A formal program of operation and maintenance procedures should be implemented by the owner, including documentation to provide complete records for future reference. Also, a formal warning system should be developed and implemented within the time period indicated in Section 7.1c. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The watershed is 0.27 sq. mi. of rolling, undeveloped, wooded terrain, which is located in the Connecticut River Basin. Some housing developments exist in the eastern section of the watershed and a new housing development is currently under construction in the same general area. The maximum impoundment to the top of dam is estimated to be 176 Ac.Ft and estimated storage below spillway crest is 118 Ac.Ft based on the assumption that normal lake elevation is the same as the spillway crest elevation. The dam is classified as being small in size having a significant hazard classification.

N.G.V.D. elevations were estimated from the Winsted U.S.G.S. Quadrangle map and were used for the computations in Appendix D so as to facilitate downstream flood routing computations. All elevations in this section have been converted to the assumed datum elevation to maintain unity in the test portion of this report. The assumed datum is based on the spillway crest equal to elevation 100.0.

5.2 DESIGN DATA

No hydraulic or hydrologic design data are available for this dam.

5.3 EXPERIENCE DATA

Serious flooding downstream of the dam more than 10 years ago was reported, and apparently a road and driveway of one house were inundated with flood water. No other details regarding this reported problem could be found. The maximum previous discharge at this dam is unknown.

5.4 TEST FLOOD ANALYSIS

The test flood for this significant hazard, small size dam is in the 100 year to half Probable Maximum Flood (½ PMF) range. Selecting ½PMF as test flood based on the involved downstream risk potential, the Corps of Engineers Recommended Guidelines for drainage areas below 2 sq. miles with rolling terrain yields a peak inflow of 350 CFS. The peak outflow is estimated to be 240 CFS with the maximum stage in the lake at 102.55, which is 0.75 feet below the top of the dam. Thus, the dam is not expected to overtop for test flood conditions. The storage routing is also performed for a 100 year peak inflow of 200 CFS and the peak outflow is estimated to be 112 CFS with the maximum stage in the Lake at 101.86. The spillway capacity with pool at top of dam is estimated to be 410 CFS which is greater than 100% of the routed test flood outflow. The outlet from the dam consists of a 24" concrete pipe with a drop inlet and its discharge capacity being small, is not included in the analysis.

5.5 DAM FAILURE ANALYSIS

Utilizing the Corps of Engineers April 1978 "Rule of Thumb Guidance for Estimating Downstream Failure Hydrographs," the peak failure outflow due to dam breach is estimated to be 36,000 CFS with an estimated flood depth of 12Ft. immediately downstream of the dam.

The flood routing was performed for peak failure outflow with maximum pool at test flood outflow elevation of 102.55. The prefailure flow in the Brook is estimated to be 240 CFS and after failure the flood stage is estimated to increase by 2.9 Ft. at the initial impact area.

The estimated peak flow rates and peak flood depths at four sections downstream of the dam resulting from a dam failure are:

D/S Section (Ft.from Dam)	Flow (CFS)	Flood Depth (Ft)	Velocity (FPS)
At Dam	36,000	12	-
2200	19,500	10.8	4.6
2600	12,000	8.3	3.6
2900	7,700	7.7	3.0
3450	3,700	5.4	2.5

A portion of Bsullak Road (3800 feet downstream) adjacent to a large swamp and one house just north of Bsullak Road would be damaged due to dam failure. The peak flow rate at this impact area is estimated to be 3,700± CFS with a flood depth of 5.4± Ft. Thus, the house, located 4± Ft. above the edge of the swamp, is likely to be inundated with 1.4± Ft. of flood water, providing the potential for the loss of less than a few lives. The road would be inundated with 3.4± Ft. of flood water, causing substantial damage to the culvert and embankment. Further downstream, a culvert on East-West Hill Road could also be impacted because of inadequate capacity.

Based upon the hydraulic and hydrologic analysis, the dam has a significant hazard classification.

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

The dam is an earth embankment with an ungated 24 inch drop inlet and an unlined spillway. The dam is 27 feet high, 10 feet wide at the top and has an upstream slope of 1.5 horizontal to 1 vertical and a downstream slope of 1.5 horizontal to 1 vertical. There is dumped riprap protection on the upstream slope with weeds and small trees on the remaining portion. There were numerous seeps observed along the toe of the dam (over 20 gpm total) resulting in soggy areas with stagnant pools of water in some places along the toe. Several depression areas or "holes" approximately 2 feet deep and 3 feet wide were observed on the downstream slope near the right abutment. These are not considered to be seepage related but appear to have been excavated or dug out for some unknown purpose. The spillway has no lining, riprap or proper "design shape". The protective cover consists of weeds and small trees. No low-level outlet for draining the lake exists at the dam.

The dam was constructed around 1965 with no construction permit or regulation on construction procedures. There are no plans available, nor is there any evidence that the dam was designed by an engineer. No correspondence concerning construction inspections could be found and the inspection report by S.E. Minor and Company in 1975 indicates that there is no seepage although our inspections on May 9 and June 3, 1980 revealed substantial seepage along the toe.

The above considerations, the problems revealed at the inspections and the relatively young age of the dam, indicate that a geotechnical investigation to determine the embankment and foundation conditions should be performed, as well as performing maintenance and repair to the embankment and appurtenances.

6.2 DESIGN AND CONSTRUCTION DATA

Design or construction data is not available, and therefor an in-depth assessment of the structural stability of the dam cannot be performed.

6.3 POST CONSTRUCTION CHANGES

There is no record of post construction changes made since the dam was built about 1965.

6.4 SEISMIC STABILITY

The dam is in Seismic Zone 1 and according to the Army Corps of Engineers Recommended Guidelines, need not be evaluated for structural stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition - Based upon the visual inspection of the site and past performance, the dam appears to be in poor condition. There are items requiring repair such as irregularities on the downstream slope, the drop inlet and its operating mechanism and the spillway channel. There are also items requiring maintenance and monitoring such as displaced riprap, erosion from trespassing and seepage through the embankment.

Based upon the "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March 1978, and hydraulic/hydrologic computations, peak inflow to the lake at the ½ PMF is 350 cfs and peak outflow is 240 cfs with the dam maintaining 0.75 feet of freeboard. The spillway capacity to the top of the dam (elevation 103.3) is 410 cfs, which is greater than 100% of the routed test flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the dam must be based solely on visual inspection, past performance of the dam, and sound engineering judgement.

c. Urgency - It is recommended that all seepage be investigated immediately upon the owners' receipt of this report and that other recommendations presented in Section 7.2 and 7.3 be implemented within 1 year of the owner's receipt of this report.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by registered professional engineer qualified in dam design and inspection pertaining to the following items. Recommendations should be made by the engineer and implemented by the owner.

1. Immediately upon receipt of this report, the owner should retain a professional engineer for development of a program to investigate the origin and significance of seepage emanating along the toe of the embankment.

2. Conduct a detailed topographic survey of the dam and prepare "as-built" drawings for future reference.

3. Perform a geotechnical investigation to determine the embankment and foundaiton conditions as related to existing seepage, the geometry of the embankment and the dam stability.

4. A spillway section and profile should be developed which will provide a design shape and protection suitable for maximum flows expected through this spillway.

5. A means of drawing down the lake in case of emergencies at the dam should be provided.

6. Another system to increase discharge into the drop inlet other than the present method of removing boards, and an access ramp to the inlet structure, should be provided.

7. Inspection of the 24 inch concrete outlet pipe for possible leakage into the pipe from the embankment.

8. Removal of large trees from embankment, backfill with suitable material and placement of proper slope protection.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken within the time period indicated in Section 7.1c, and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of heavy precipitation and high project discharge. The owner should develop and implement an emergency action plan as well as a downstream warning system in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference. The maintenance procedures should include documented monthly inspections by the owner or owner representative.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam design and inspection should be instituted on a biennial basis.

4. Small trees and brush should be cut and removed from the dam.

5. Displaced riprap along the upstream slope should be repaired.

6. Areas on upstream slope eroded by trespassing should be regraded and proper slope protection placed.

7. The irregularities at the right end of the downstream slope should be backfilled and proper protection placed.

8. Remove all debris and clear trees and brush from the spillway and spillway discharge channel.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Laurel Lake Dam

DATE: May 9, 1980

TIME: 12:45 - 2:15 PM

WEATHER: Sunny - 70°F

W.S. ELEV. 100.2± U.S.

U.S.

PARTY:	INITIALS:	DISCIPLINE:
1. Peter M. Heynen	PMH	Cahn - Geotechnical
2. Miron Petrovsky	MP	Cahn - Geotechnical
3. Jay A. Costello	JAC	Cahn - Geotechnical
4. Murali Atluru	MA	DTC - Hydrology
5. Jeffrey O. Borne	JB	Cahn - Geotechnical
6. Tim Kavanaugh	TK	Cahn - Survey

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment	PMH, JAC, MP, JB, TK	A-2
2.	Spillway	PMH, JAC, MA, MP, JB, TK	A-3
3.	Intake Structure	PMH, JAC, MA, MP, JB	A-4
4.	Outlet	PMH, JAC, MA, MP, JB, TK	A-5
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Laurel Lake Dam DATE May 9, 1980

PROJECT FEATURE Embankment BY PMH, JAC, MP, JB, TK

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	103.3
Current Pool Elevation	100.2±
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	Appears good
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	yes - footpaths
Sloughing or Erosion of Slopes or Abutments	yes - depressions in d/s slope & erosion from footpaths
Rock Slope Protection-Riprap Failures	yes - some rock displaced
Unusual Movement or Cracking at or Near Toes	None observed
Unusual Embankment or Downstream Seepage	yes - seepage > 20± gpm, clear on d/s slope
Piping or Boils	None observed
Foundation Drainage Features	
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

PROJECT Laurel Lake Dam DATE May 7, 1980

PROJECT FEATURE Spillway BY PMH, JAC, MP, MA, JB, TK

AREA EVALUATED	CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a) **Approach Channel**	
General Condition	good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	
Floor of Approach Channel	Sand & Gravel, gently sloping
b) **Weir and Training Walls**	
General Condition of Concrete	N/A
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c) **Discharge Channel**	
General Condition	poor
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	yes
Floor of Channel	poor- debris & trees in channel
Other Obstructions	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Round Lake Dam DATE May 9, 1980

PROJECT FEATURE Drop Inlet BY PMH,JAC,MP,MP,JB

AREA EVALUATED		CONDITION
OUTLET WORKS-INTAKE CHANNEL AND INTAKE STRUCTURE		Metal frame w/ wooden slats generally poor condition
a) Approach Channel		
Slope Conditions		N/A
Bottom Conditions		
Rock Slides or Falls		
Log Boom		
Debris		
Condition of Concrete Lining		
Drains or Weep Holes		
b) Intake Structure		
Condition of Concrete		N/A
Stop Logs and Slots		mechanism to raise slats in poor condition

PERIODIC INSPECTION CHECK LIST

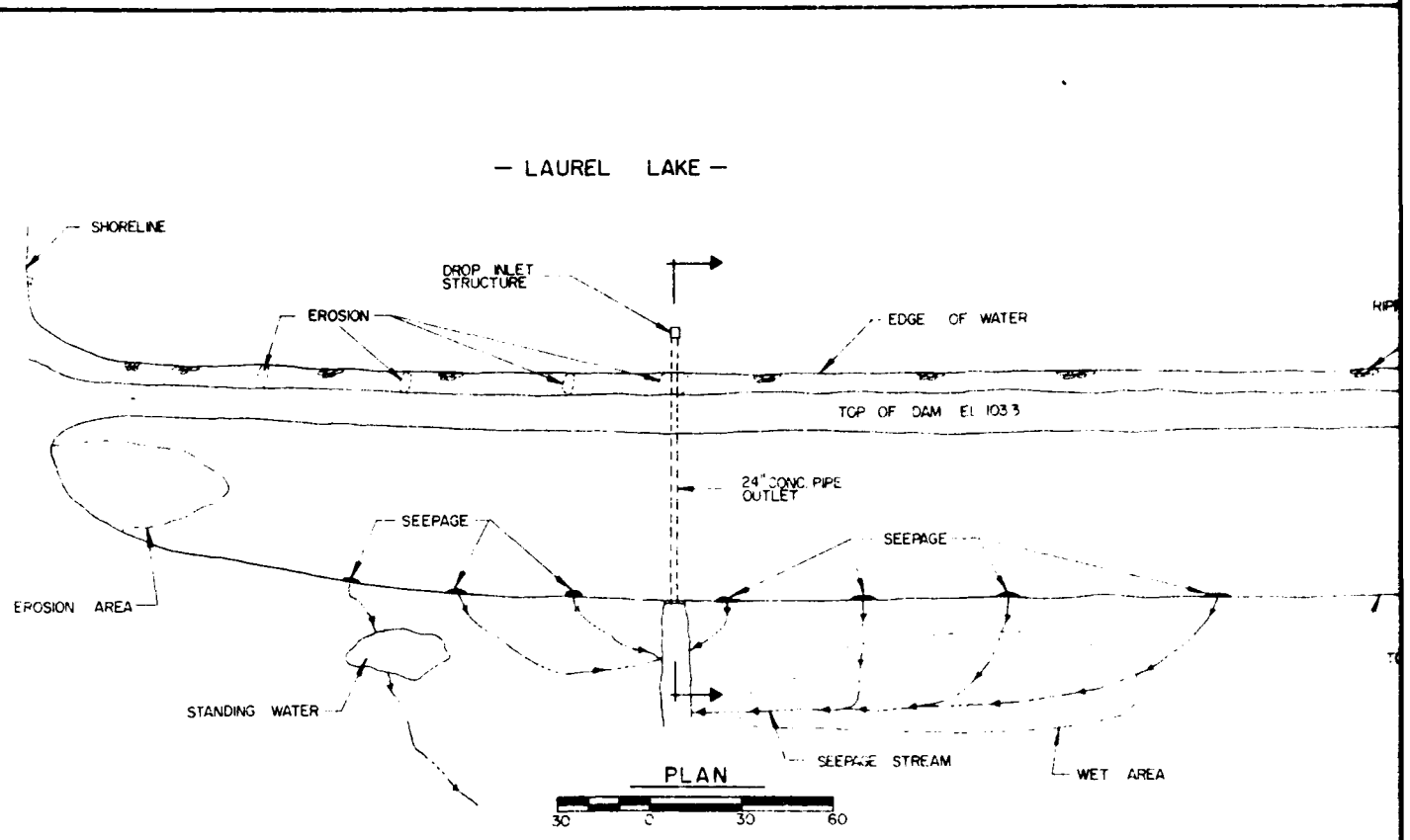
PROJECT [illegible] Dam DATE May 1, 1980

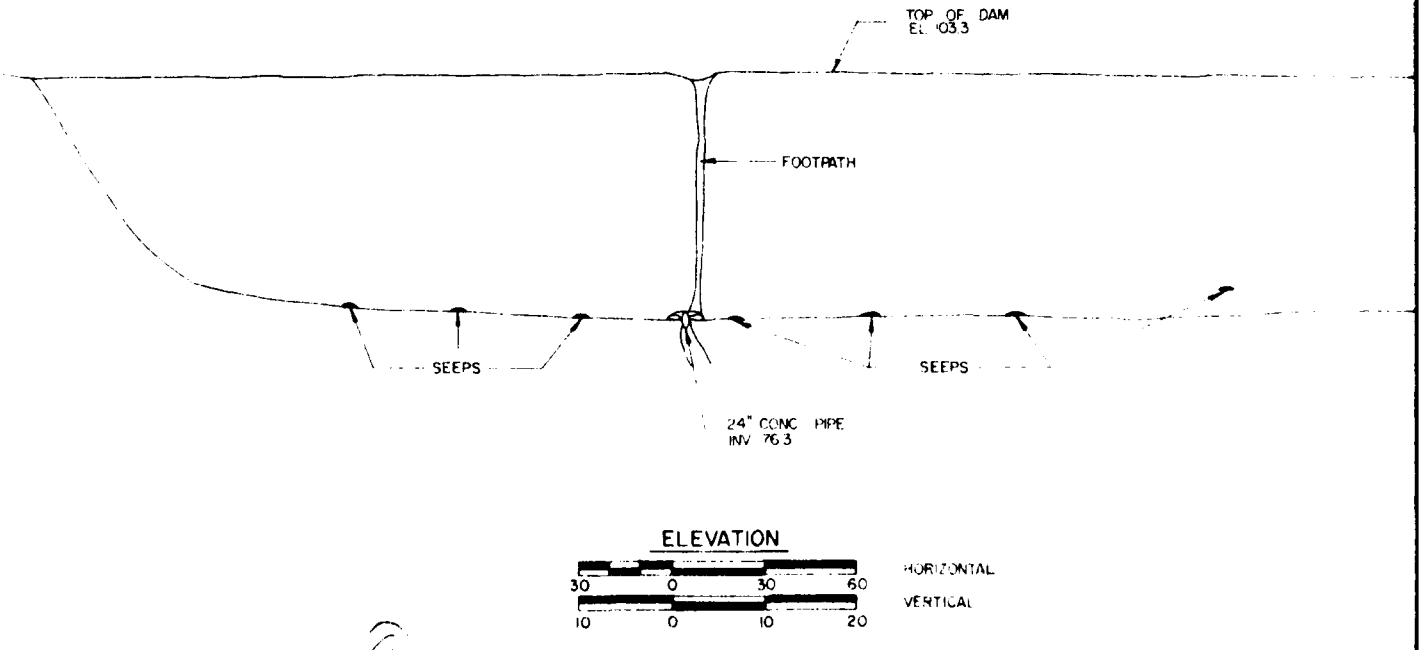
PROJECT FEATURE Outlet BY [illegible]

AREA EVALUATED	CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	N/A
Rust or Staining	
Spalling	
Erosion or Cavitation	erosion around outlet pipe
Visible Reinforcing	None
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	N/A
Channel	
Loose Rock or Trees Overhanging Channel	Trees all along channel
Condition of Discharge Channel	poor - debris, trees in channel

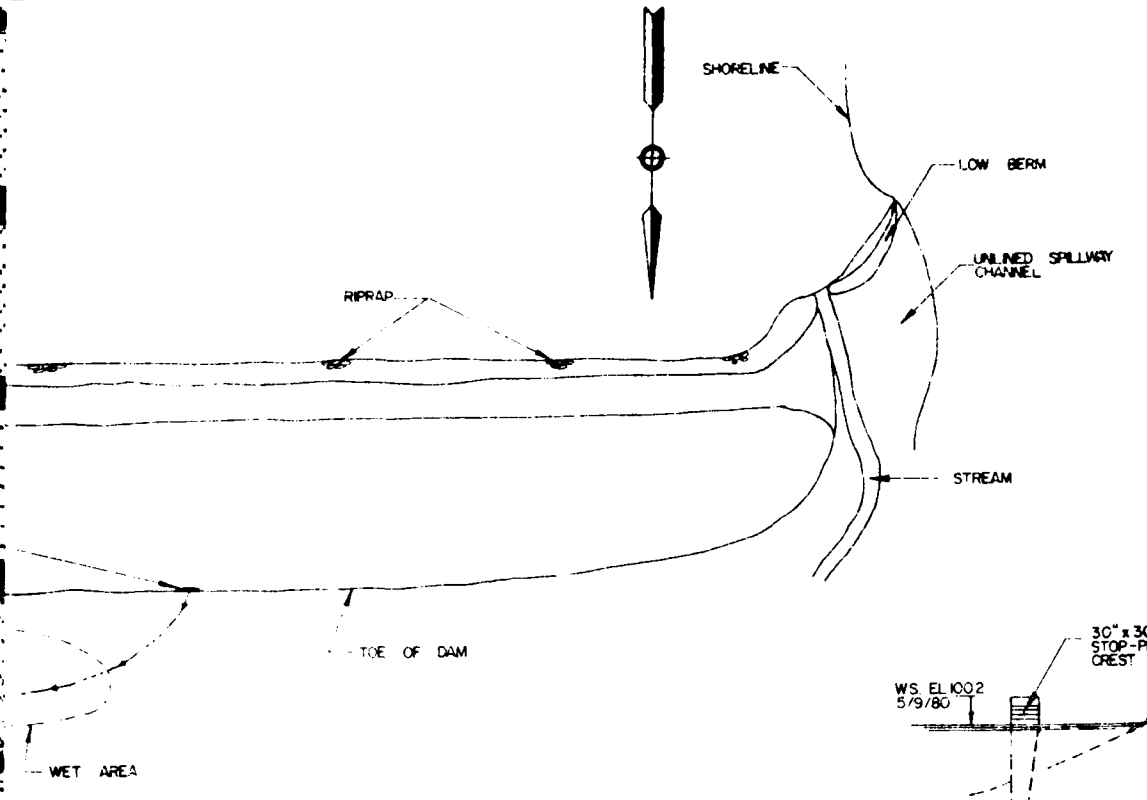
APPENDIX B

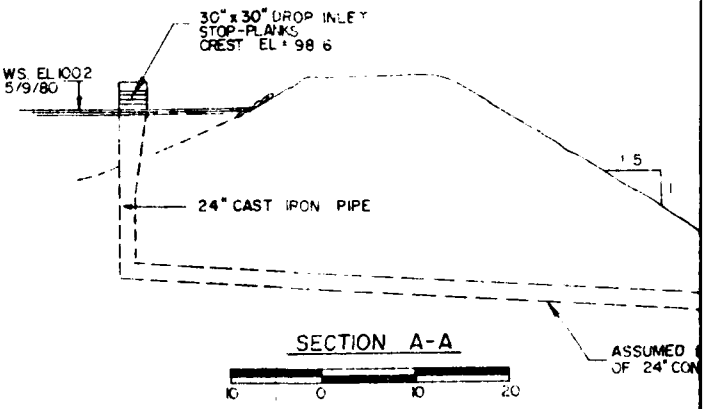
ENGINEERING DATA AND CORRESPONDENCE


— LAUREL LAKE —
SHORELINE
DROP INLET STRUCTURE
EROSION
EDGE OF WATER
TOP OF DAM EL 103.3
24" CONC. PIPE OUTLET
SEEPAGE
SEEPAGE
EROSION AREA
STANDING WATER
SEEPAGE STREAM
WET AREA
PLAN
30 0 30 60


TOP OF DAM EL 103.3
FOOTPATH
SEEPS
SEEPS
24" CONC PIPE INV 76.3
ELEVATION
HORIZONTAL
30 0 30 60
VERTICAL
10 0 10 20

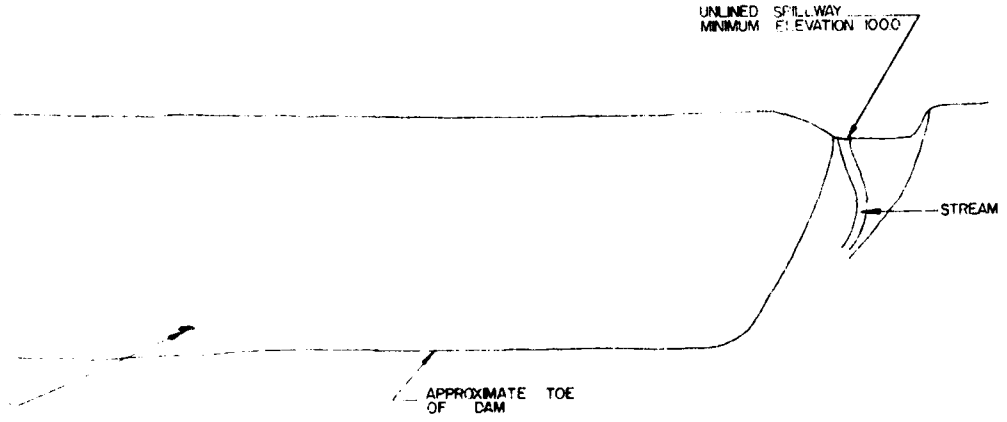
a





SECTION A-A

10 0 10 20



NOTES

1. THIS PLAN WAS COMPILED
INSPECTION OF THE DAM
DIMENSIONS SHOWN ARE AP
AND/OR STRUCTURAL FEAT

2. NO N.G.V.D. ELEVATIONS WE
OR LAKE SURFACE ALL
PLAN ARE BASED ON AN
EQUAL TO 1000

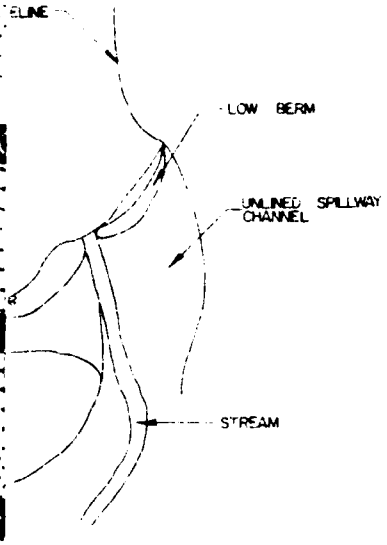
CAHN ENGINEERS INC.
WALLINGFORD, CONNECTICUT
ENGINEER

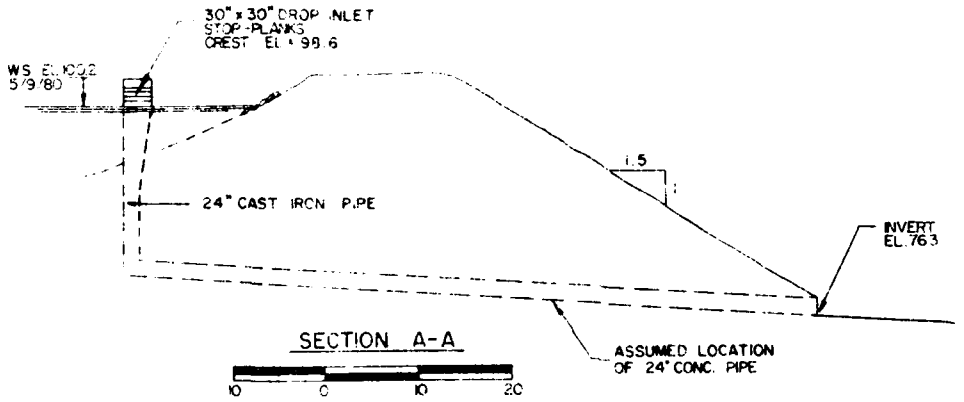
NATIONAL PROGRAM OF
PLAN EL

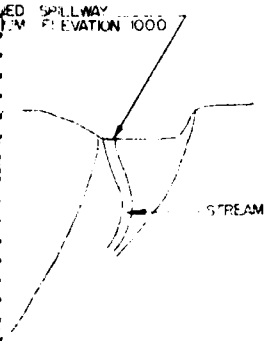
LAUREL

TR- MORGAN BROOK

DRAWN BY	CHECKED BY	APPR
M. N...	JAC	







NOTES

1. THIS PLAN WAS COMPILED FROM CAHN ENGINEERS INSPECTION OF THE DAM DATED MAY 9, 1980. DIMENSIONS SHOWN ARE APPROXIMATE. NOT ALL TOPOGRAPHIC AND/OR STRUCTURAL FEATURES ARE NECESSARILY IDENTIFIED.

2. NO N.G.V.D. ELEVATIONS WERE AVAILABLE FOR THE DAM OR LAKE SURFACE. ALL ELEVATIONS SHOWN ON THIS PLAN ARE BASED ON AN ASSUMED SPILLWAY ELEVATION EQUAL TO 1000.

CAHN ENGINEERS INC. WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PLAN ELEVATION AND SECTION

LAUREL LAKE DAM

TR- MORGAN BROOK NEW HARTFORD, CT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE AS NOTED	
M. Norman	JRC	[illegible]	DATE SEPT. 1980	SHEET 8

LAUREL LAKE DAM

EXISTING PLANS

No information is available

SUMMARY OF DATA AND CORRESPONDENCE

No. ____________ WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Lat 41-53.2

4

CT-377

Inventoried By [illegible]

Date 8/6/71

Name of Dam or Pond Laurel Lake (Lake Lausanne)

Code No. F45.2WB[illegible]

Nearest Street Location (west off Turnbull Rd.

* As of Sept-1971 - Int'l Laurel Dev. Corp. % Morton L. Dansey, RR Bishops Cor., W. Htfd.

Town New Hartford

U.S.G.S. Quad. Winsted

ok 7/73

Name of Stream unnamed tributary of Morgan Bk.

Owner ~~[illegible] Laurel [illegible] Corp~~ former owners: ~~Laurel Lake Corp. (Walter Lynch)~~

Address ~~[illegible]~~ before that: Sherwood Wilson (owner when dam was built)

Pond Used For "development" project (DA 0.12 smi)

Dimensions of Pond: Width 500' Length 1500' Area 17 acres

Total Length of Dam 500' Length of Spillway (1) 2x2x2x2 drop pipe (2) emergency (grass) total ± 38'

Location of Spillway drop spillway (top is square) in middle of dam, emergency spillway on west end.

Height of Pond Above Stream Bed 15' ±

Height of Embankment Above Spillway 2½' ±

Type of Spillway Construction see over for sketch

Type of Dike Construction earth

Downstream Conditions woods, swamp, roads

Summary of File Data none up to date of this inspection

(DA ≈ 0.39 sqmi)

Remarks should require owner to submit plans etc.

1960

SEE OVER FOR SKETCH

Would Failure Cause Damage? probably Class B

August 26, 1971

Mountain Laurel Development Corp.
820 Park Avenue
Bloomfield, Connecticut

Attn: Mr. Isadore Case

Re: Laurel Lake Dam
(Lake Lausanne Dam)
New Hartford

Dear Mr. Case:

According to the records in this office, the dam on Laurel Lake (also referred to as Lake Lausanne) in New Hartford is under your ownership.

The Water Resources Commission under the General Statutes of the State, a copy of which is enclosed, has jurisdiction over all dams, "--which by breaking away or otherwise might endanger life or property--". Since this dam could cause damage in the event of failure it is under the jurisdiction of the Water Resources Commission.

The 1956 U.S. Geological Survey map does not indicate a lake at this location but when these maps were photo-revised in 1969, this lake was evident. According to the assessor's office in the Town of New Hartford, this property was formerly owned by a Mr. Sherwood Wilson and the dam was apparently built some 10 or 15 years ago while under his ownership. We have searched our files and can find no record of a Construction Permit being issued for this dam as required under General Statute 25-112.

As the present owner of the dam, you are responsibile for its safety.

We request that you submit as-designed and as built plans for this dam, prepared by an engineer registered in the State of Connecticut and bearing his seal and signature. We also request that your engineer submit a report on the overall safety

of the structure including an analysis of the capacity of the facilities to pass the design run-off without overtopping. This dam was inspected by a member of our staff on August 6, 1971, and general seepage was emerging from the ground along the toe of the dam. Your engineer should investigate the influence of this seepage on the safety of the dam. It was noted that the structure was covered with brush and small trees and these should be cut down and removed immediately, with special attention given to the clearing of the emergency spillay on the west end of the dam, to permit the free flow of water at flood time.

It is requested that you advise the Commission in writing prior to September 15, 1971, as to your intentions in submitting engineering plans and report as mentioned above.

Very truly yours,

John J. Currey
Director

JJC:WHO:ljg

Enclosure

MORTON L. DANSEYAR
Certified Public Accountant
[illegible] North Main Street
West Hartford, Connecticut 06107

Member
American Institute of Certified Public Accountants
Connecticut Society of
Certified Public Accountants

September 17, 1971

Mr. J. Curry
State of Connecticut
Water Resources Dept.
Hartford, Conn.

Re: Mt. Laurel Development Corp.
Lake Lausanne

Gentlemen:

Mountain Laurel Development Corporation is engaging Morton Fine Assoc., Engineers to submit as designed, and as built plans and a report on the overall structure of the dam.

This work is to be done immediately.

Very truly yours,

Morton L. Danseyar

MLD:ds

STATE WATER RESOURCES COMMISSION
RECEIVED
SEP 23 1971
ANSWERED _____
REPLIED _____

INTERDEPARTMENT MAIL

DATE: September 17, 1971

TO: File

DEPARTMENT: [illegible] Water Resources Commission

FROM: William H. O'Brien, III, Civil Engineer

DEPARTMENT: Water Resources Commission

SUBJECT: Laurel Lake Dam (Lausanne Dam), New Hartford

On September 17, 1971, the undersigned called and spoke to Mr. Isadore Case about the subject dam.

He had received our letter of August 26, 1971 and had determined that the original plans were not prepared by an engineer. I told him this matter would probably be brought before the Commission at its September 20, 1971 meeting for whatever action they may wish to take.

William H. O'Brien

Civil Engineer

WHO:ljg

August 15, 1972

Mountain Laurel Development Corp.
c/o Mr. Morton Danseyar
Bishops Corner
West Hartford, Connecticut

Attention: Mr. Morton Danseyar

Re: Laurel Lake Dam
(Lake Lausanne Dam)
New Hartford

Gentlemen:

On September 23, 1972 an order was issued to you by the Water Resources Commission to submit an engineering report and findings on the safety of the dam by December 31, 1971.

You have informed us that the firm of Morton Fine Associates has been retained to submit such a report to us.

On June 13, 1972 we again wrote to you requesting assurances that an engineering report would be forthcoming. Our records indicate no reply to this letter. Please advise us by return mail as to when we may expect to receive your engineer's report and findings so that more formal action will not be required.

Very truly yours,

Stephen C. Thomson, Director
Water and Related Resources

SCT:WHO:ljg

S. E. MINOR & CO., INC.
CIVIL ENGINEERS
161 MASON STREET
GREENWICH, CONNECTICUT 06830

August 8, 1975

State of Connecticut
Department of Environmental Protection
State Office Building
Hartford, Connecticut 06115

Attention: Mr. Victor F. Galgowski
Superintendent of Dam Maintenance
Water and Related Resources

Re: Laurel Lake Dam
(known as Lake Luzan)
New Hartford, Connecticut

Dear Mr. Galgowski:

In accordance with your request, we have examined the subject dam in order to ascertain its structural soundness and stability. Prior to our visit to the site, we went to the Town Hall offices and attempted to obtain any structural drawings of the subject installation. We were advised that no plans were on file and that the Town officials had no knowledge whatsoever of the construction of the dam.

Upon visiting the site, which was located on a tributary to Morgan Brook in the northwest section of town, we found the dam to be an earth dam with approximately four feet of freeboard and the top to be approximately ten feet wide. The slope on the back of the dam was approximately one on three and had loose riprap of cobbles and boulders. The face of the dam is sloped at approximately one on one and drops in the vicinity of 30 feet vertically. The face of the dam is heavily overgrown and upon inspection of same we found no evidence of leaks, fissures, or boils. The blow-off chamber consists of approximately a 3' by 3' square overfall which is piped off to the stream below. The total length of the dam is about 575 feet, and the blow-off chamber is located approximately in the center and about ten feet back from the water line.

It is our considered opinion that the dam is structurally sound and not in danger of overtopping. We feel that said dam with normal maintenance will service for many years.

Respectfully submitted,

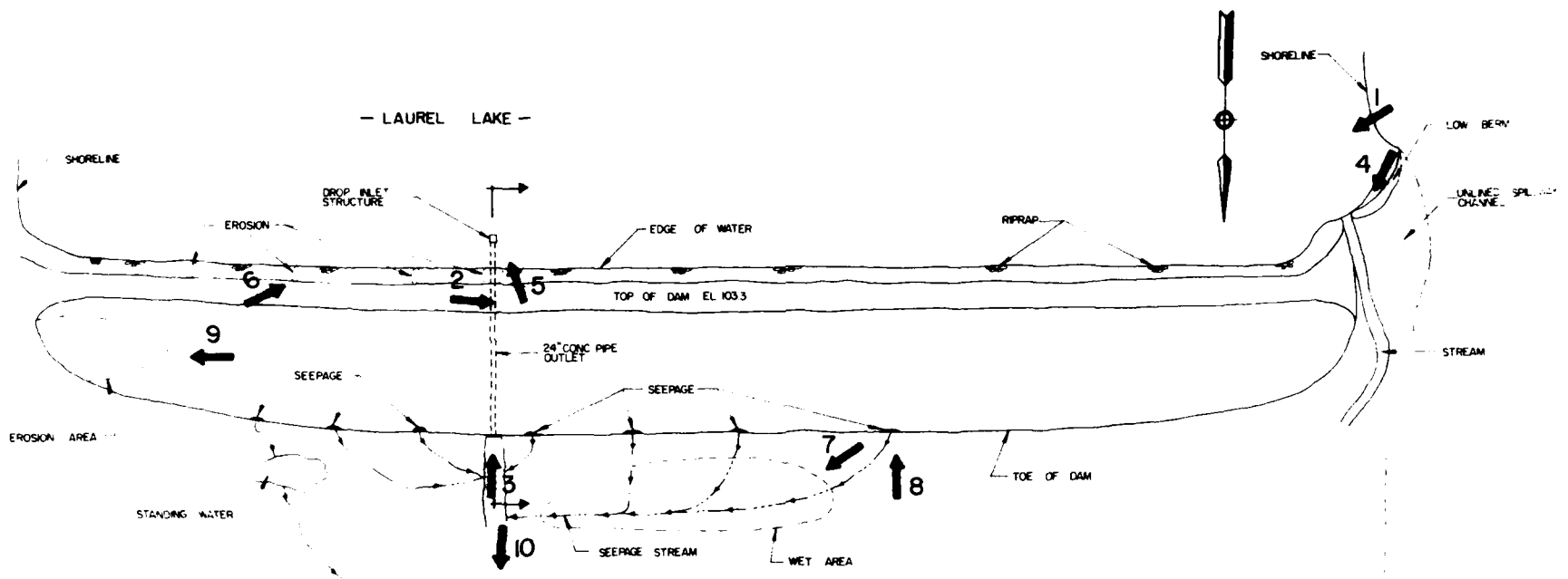
S. E. MINOR & CO., INC.

Edward F. Ahneman, Jr., P.E.
Chief Engineer

EFA:lb

APPENDIX C

DETAIL PHOTOGRAPHS



2 → PHOTO NUMBER AND DIRECTION

PHOTO LOCATION PLAN

LAUREL LAKE DAM

SHEET C-1

Photo 1 - Upstream slope from left shore, (May, 1980).

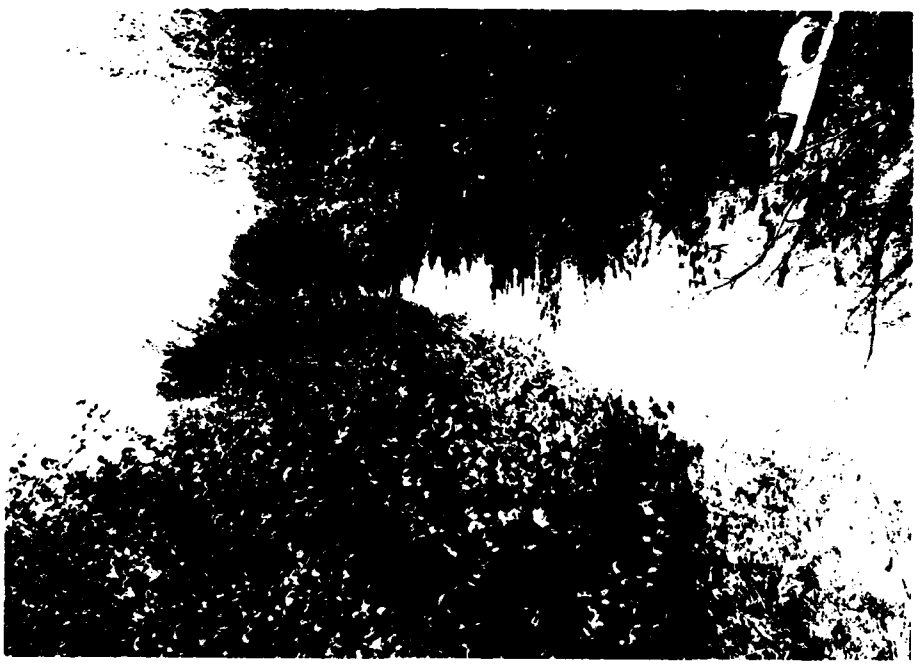


Photo 2 - Top of dam looking toward left end, (May, 1980).

Photo 3 - Downstream slope from outlet discharge channel. Outlet pipe at lower left of photo, (May, 1980).

Photo 4 - Unlined spillway at left end of dam. Overflow occurs at small stream at right side of spillway, (May, 1980).

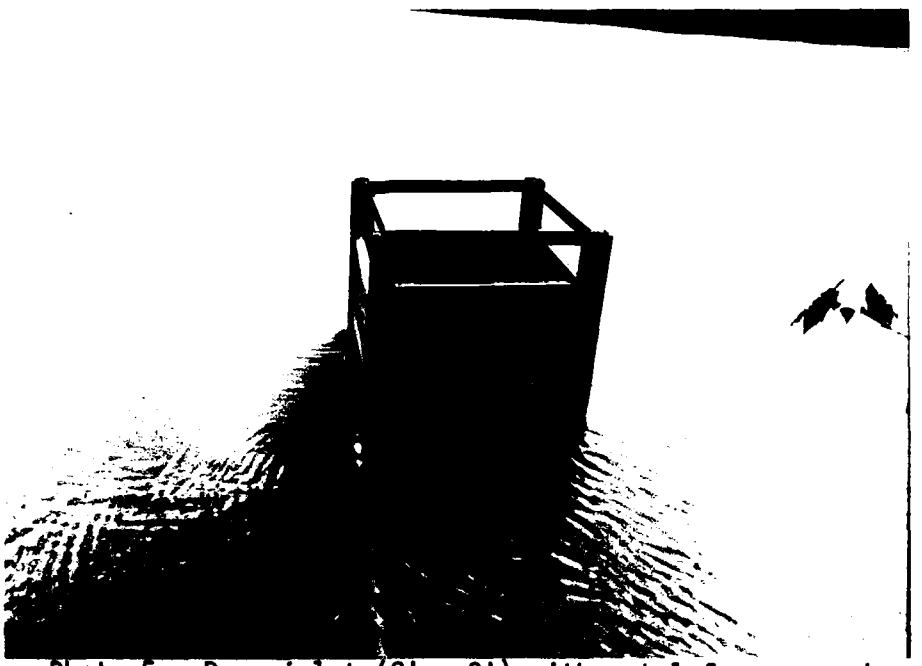


Photo 5 - Drop inlet (2' x 2') with metal frame, wood slats and pipe for control mechanism, (May, 1980).

Photo 6 - Area of erosion from trespassing on upstream slope, (May, 1980).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Laurel Lake Dam TR-Morgan Brook New Hartford, CT
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE # 27 785 KE DATE Sept. 1980 PAGE C-3

Photo 7 - Wet area at central portion of the toe of the embankment, (May, 1980).

Photo 8 - Seepage at central portion of embankment, flow rate is approximately 5 gpm, (May, 1980).

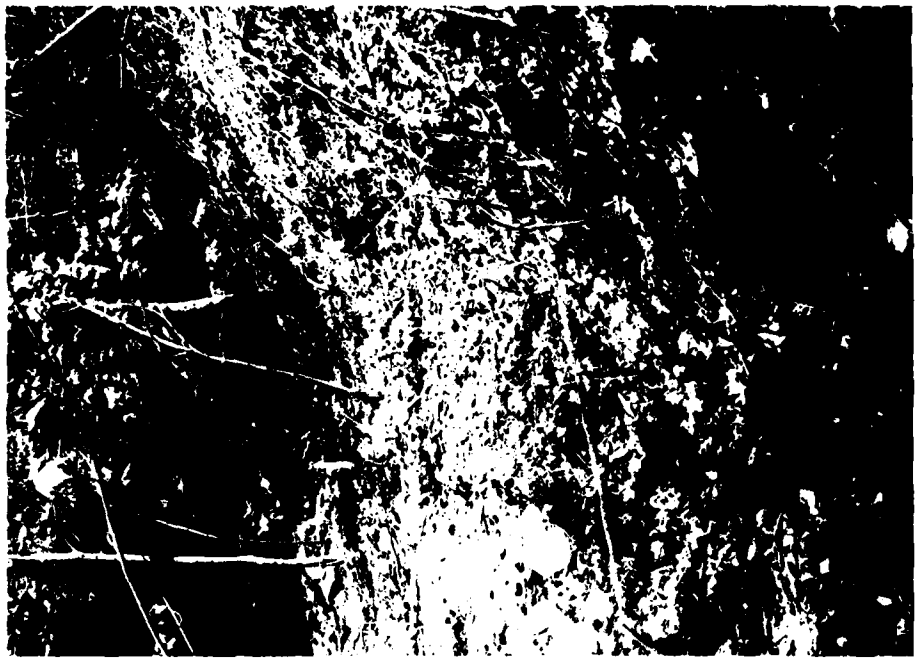


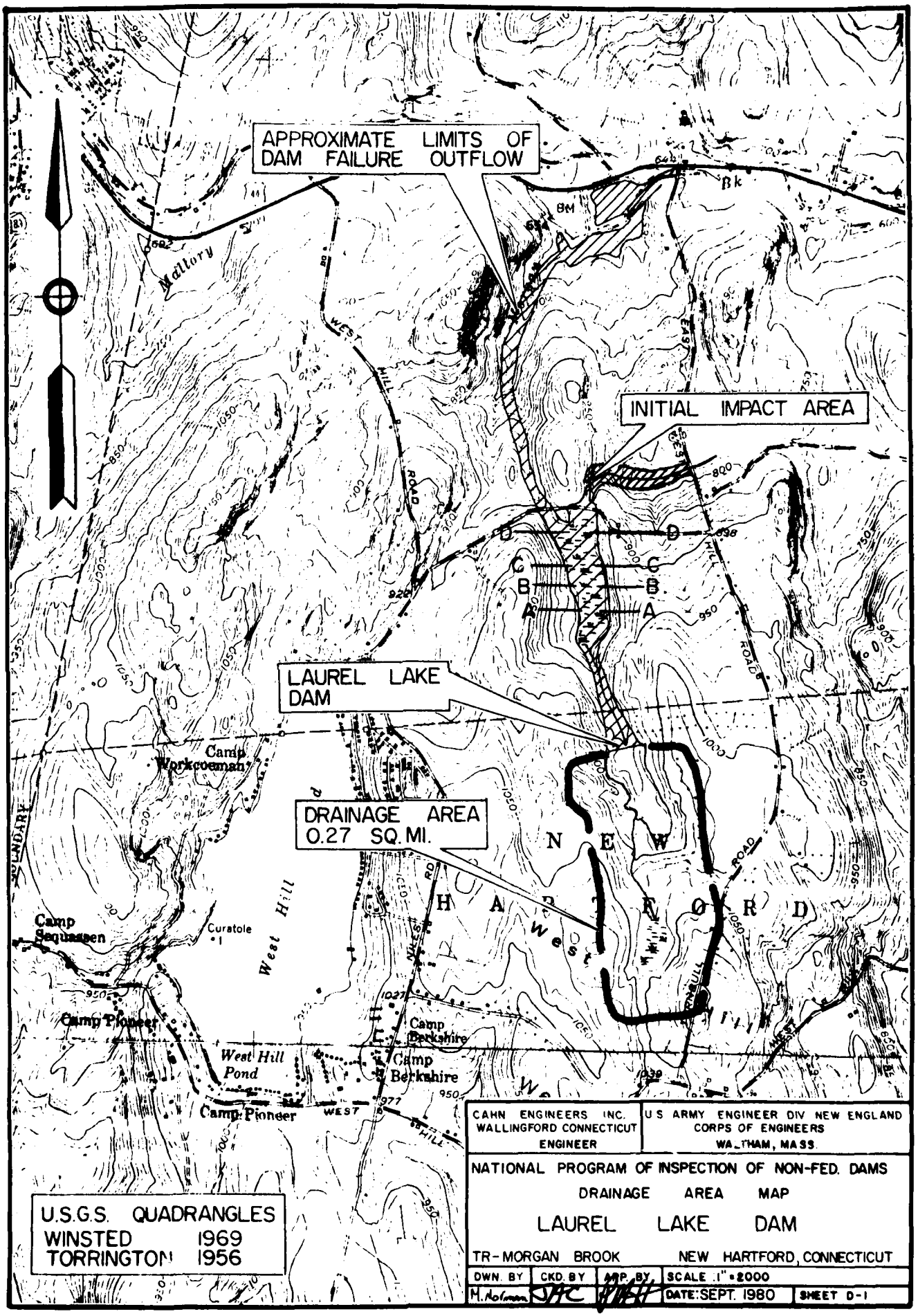
Photo 9 - Eroded or excavated "holes" on downstream slope at the right end of the embankment, (May, 1980).

Photo 10 - Outlet discharge channel looking downstream, (May, 1980).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS	NATIONAL PROGRAM OF	Laurel Lake Dam
	INSPECTION OF	TR-Morgan Brook
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	NON-FED. DAMS	New Hartford, CT
		CE# 27 785 KE
		DATE Sept. 1980 PAGE C-5

APPENDIX D

HYDRAULICS/HYDROLOGIC COMPUTATIONS


APPROXIMATE LIMITS OF DAM FAILURE OUTFLOW
INITIAL IMPACT AREA
LAUREL LAKE DAM
DRAINAGE AREA 0.27 SQ. MI.
Mallory
WEST HILL ROAD
EAST HILL ROAD
Camp Workcoeman
Camp Sequassen
Curatole
West Hill Pond
Camp Pioneer
Camp Berkshire
NEW HARTFORD
U.S.G.S. QUADRANGLES
WINSTED 1969
TORRINGTON 1956
CAHN ENGINEERS INC. WALLINGFORD CONNECTICUT ENGINEER
U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
DRAINAGE AREA MAP
LAUREL LAKE DAM
TR-MORGAN BROOK NEW HARTFORD, CONNECTICUT
DWN. BY H. Norman
CKD. BY JAC
APP. BY
SCALE 1" = 2000
DATE: SEPT. 1980
SHEET D-1

PROBABLE MAXIMUM FLOOD (PMF) DETERMINATION

DRAINAGE AREA – 0.27 SQ. M. (PLANIMETERED FROM USGS MAP)

WATERSHED CLASSIFICATION – "ROLLING" BASED UPON USGS MAP AND SITE VISITS

PMF PEAK INFLOW – FOR DRAINAGE AREA < 2 SQ. MI. THE CORPS OF ENGINEERS RECOMMENDS CSM VALUES TO BE IN THE 2000 TO 2500 CFS/SQ. MI. RANGE. FOR ABOVE CONDITIONS PEAK FLOW RATE SELECTED = 2500 CFS/SQ. MI.
∴ PMF PEAK INFLOW: 2500 × 0.27 ≅ 700 CFS.

SIZE CLASSIFICATION –
FOR THE PURPOSE OF DETERMINING PROJECT SIZE, THE MAXIMUM STORAGE ELEV. IS CONSIDERED EQUAL TO THE TOP OF DAM

TOP OF DAM	= 978.3*
INVERT OF OUTLET PIPE	= 951.3*
HEIGHT OF DAM	27.0 FT.

* THE NORMAL LAKE ELEVATION IS NOT INDICATED ON THE USGS MAP. HOWEVER, EXAMINING THE CONTOURS ON THE USGS MAP, THE NORMAL LAKE ELEVATION IS ASSUMED TO BE 975 NGVD AND IS ASSUMED TO BE THE SAME FOR THE SPILLWAY CREST. ALL OTHER ELEVATIONS ARE REFERENCED TO THIS ASSUMED ELEVATION AND ARE DETERMINED BASED UPON CAIN ENGINEERS FIELD INFORMATION.

PLANIMETERING FROM USGS MAP FOR LAKE SURFACE AREAS—

AT EL. 975 (SPILLWAY CREST) = 15 ACRES
AT EL. 980 = 22 ACRES
AT EL. 990 = 32 ACRES

A STAGE-LAKE AREA CURVE IS PLOTTED (SHEET 3)
FROM THIS CURVE, LAKE AREA AT TOP OF DAM = 20 ACRES
AVERAGE LAKE AREA BETWEEN SPILLWAY CREST
AND TOP OF DAM = 17.5 ACRES
∴ STORAGE BETWEEN SPILLWAY CREST AND TOP OF DAM
$= 3.3 \times 17.5 = 58$ AC. FT.

STORAGE BETWEEN SPILLWAY CREST AND LAKE AT EL. 980 = 73 AC. FT.

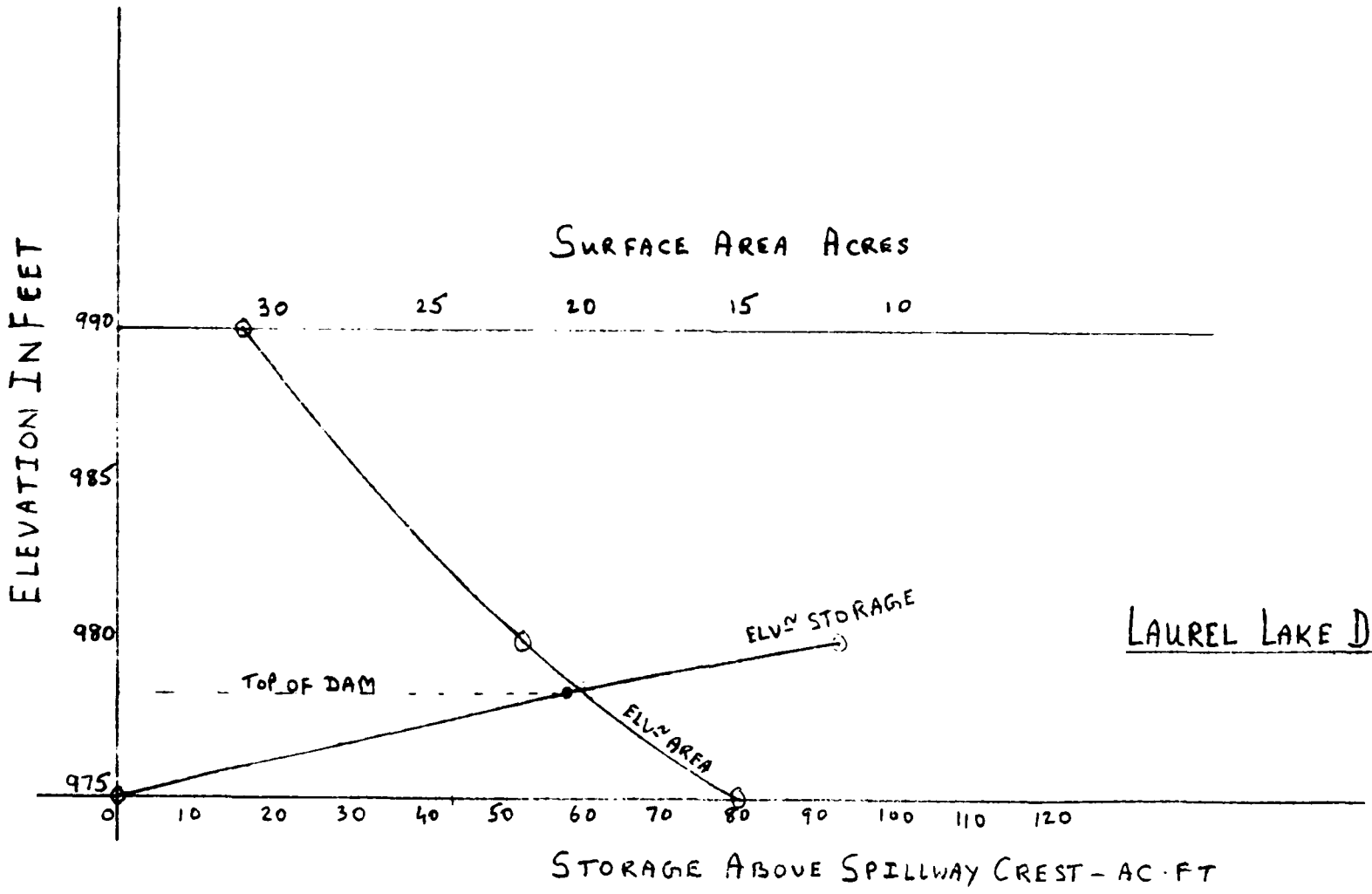
ESTIMATED STORAGE BELOW SPILLWAY CREST $= \frac{1}{3}bh$
$= \frac{1}{3} \times 15 \times 23.7 = 118$ AC. FT.

(b = 15, h = EL. 975.0 − EL. 951.3 = 23.7')

∴ MAXIMUM IMPOUNDMENT TO TOP OF DAM = 58 + 118 = 176 AC. FT.

A STAGE-STORAGE CURVE IS PLOTTED ON SHEET 3

THUS ACCORDING TO COE'S OF ENGINEERS GUIDELINES TABLE 1, THE LAUREL LAKE DAM IS CLASSIFIED AS SMALL BASED UPON THE STORAGE CAPACITY OF 176 AC. FT. (< 1000 & ≥ 50) AND THE HEIGHT OF DAM OF 27' ($< 40'$ & $\geq 25'$)



LAUREL LAKE DAM

SHEET 3 OF 25

DATE 7/7/80

BY MM 7/5/80

D-3

HAZARD POTENTIAL — SIGNIFICANT HAZARD POTENTIAL BASED UPON DAM BREACH ANALYSIS AND RELATIVE LOCATIONS OF HOUSES AND OTHER STRUCTURES. A DETAILED DISCUSSION OF FAILURE HAZARD POTENTIAL IS INCLUDED AT THE END OF BREACH ANALYSIS SECTION OF APPENDIX - D.

SELECTION OF TEST FLOOD —
FOR THE SMALL SIZE AND SIGNIFICANT HAZARD POTENTIAL CLASSIFICATION, TABLE 3 OF CORPS OF ENGINEERS RECOMMENDED GUIDELINES, THE TEST FLOOD COULD BE IN THE 100 YR TO 1/2 PMF RANGE.
BASED ON THE INVOLVED RISK POTENTIAL DOWNSTREAM OF THE DAM, A TEST FLOOD = 1/2 PMF IS SELECTED.

TEST FLOOD PEAK INFLOW = $\frac{1}{2}$ X 700 CFS = 350 CFS

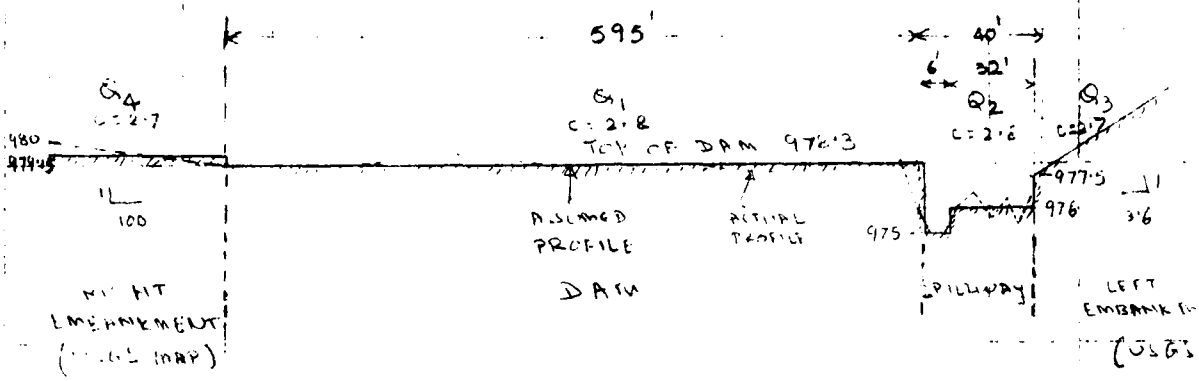
1/2 PMF WOULD RESULT FROM $9\frac{1}{2}$" RUNOFF FROM 0.27 □ MILES OF DRAINAGE AREA.

∴ TOTAL STORM VOLUME = $\frac{9\frac{1}{2}}{12}$ × 0.27 × 640 ≅ 137 AC-FT.

THUS MAXIMUM STORAGE (BETWEEN SPILLWAY CREST AND TOP OF DAM) OF 58 AC-FT. IS ONLY 42% OF THIS STORM VOLUME.

NOTE: SURCHARGE STORAGE ROUTING IS PERFORMED FOR A 100 YEAR PEAK FLOOD FLOW

COMPOSITE DISCHARGE RATING CURVE



APPROXIMATE POTENTIAL OVERFLOW PROFILE

(SPILLWAY & DAM PROFILE BASED ON C.E FIELD INFORMATION)

DAM C = 2·8 ASSUMED (EARTHEN, BRUSH) (THE 15' INCLINED SECTION OF THE DAM IS ESTIMATED TO CONTRIBUTE A VERY SMALL DISCHARGE FLOW AND IS CONSIDERED COMPENSATED BY APPROXIMATION OF DAM CREST ELEVATION)

$Q_1 = CLH^{3/2}$ CREST EL = 978·3 (AVERAGE) L = 580' + 15'

$= 1666\,H^{3/2}$

SPILLWAY

$Q_2 = Q_2' + Q_2''$

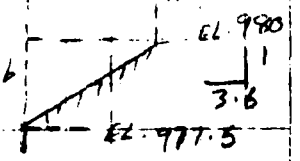
$Q_2' = CLH^{3/2}$ C = 2·8 ASSUMED (IRREGULAR SHAPE, STONES)
$= 16.8\,H^{3/2}$ L = 6' ASSUMED
CR EL = 975 (AVERAGE)

$Q_2'' = CLH^{3/2}$ L = 32' ASSUMED
$= 89.6\,H^{3/2}$ CR EL = 976 (AVERAGE)

LEFT ABUTMENT $Q_3 = \frac{2}{5} CL\,(hb^{5/2} - ha^{5/2})$ * (hb − ha)

C = 2·7 EL = 977·5

ha · C



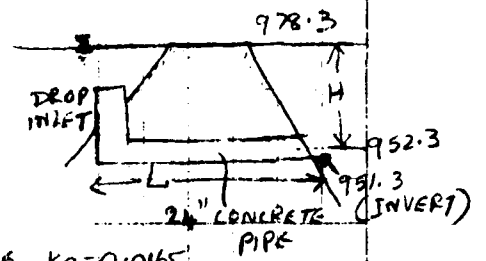
* NOTE: USGS RECOMMENDED FORMULA FOR MORE PRECISE DISCHARGE OVER INCLINED DAM/EMBANKMENT CREST. REF: MEASUREMENT OF PEAK DISCHARGES AT DAMS BY INDIRECT METHODS. USGS BOOK 3. CHAPTER A5, PAGE 34. 1968)

RIGHT SEGMENT

$Q_4 = CLH^{3/2}$ C = 2.7 ASSUMED, L = 175'

$= 472.5 H^{3/2}$ CREL. 979.15 (AVERAGED, SINCE THE SLOPE IS VERY SMALL)

LOW LEVEL OUTLET—



THE DIAMETER OF THE CONDUIT IS ASSUMED TO BE 24" AND THE DISCHARGE Q_5 FOR POOL AT TOP OF DAM IS ESTIMATED TO BE 70CFS (ACCOUNTING FOR USUAL LOSSES. BY USING

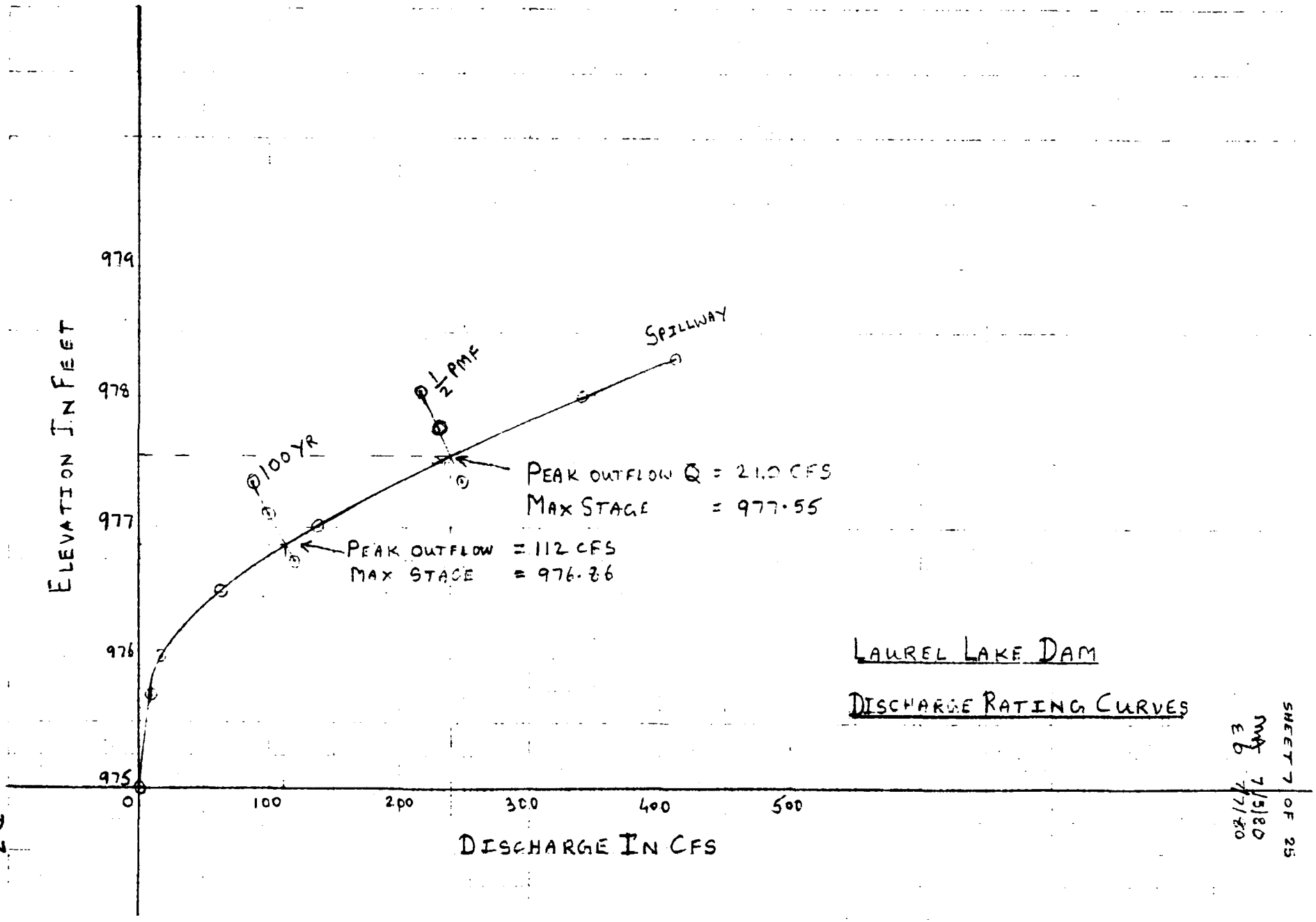
$Q_5 = a\sqrt{\frac{2gH}{1+K_e+K_b+K_p \times L}}$ $K_e = 0.5$ $K_b = 0.45$, $K_p = 0.0165$ AND L = 95' FOR FULL FLOW CONDITION (P-21-63 "HAND BOOK OF APPLIED HYDROLOGY" BY VEN TE CHOW) HOWEVER, FOR THE LOW HEAD CONDITION, THE PIPE WOULD FLOW PARTLY FULL. THUS THE DISCHARGE WOULD BE MUCH LESS THAN 70CFS.

TABULATION OF DISCHARGE RATES (CFS)

	ELVN.	DAM Q_1	SPILLWAY Q_2	LEFT ABT. Q_3	R.T ABUT. Q_4	TOTAL Q
	975	0	0	0	0	0
	975.7	0	10	0	0	10
	976	0	17	0	0	17
	976.5	0	64	0	0	64
100 YR	976.86	0	112	0	0	112
	977	0	137	0	0	137
	977.5	0	230	0	0	230
MAX. POOL ($\frac{1}{2}$ PMF)	977.55	0	240	0	0	240
	978	0	340	1	0	341
TOP OF DAM	978.3	0	410	2	0	412
	978.6	275	490	5	0	770

NOTE: CONSIDERING THE OVERFLOW CAPACITIES ABOVE, THE DISCHARGE CAPACITY OF THE LOW LEVEL OUTLET IS NEGLECTED.

DISCHARGE RATING CURVES FOR TOTAL Q & SPILLWAY ARE SHOWN ON SHEET 7.



LAUREL LAKE DAM

DISCHARGE RATING CURVES

SHEET 7 OF 25
SWH 7/5/80
7/7/80

D-7

DETERMINATION OF PEAK OUTFLOW—

BY USING THE CORPS OF ENGINEERS GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD

FOR 350 CFS ($\frac{1}{2}$ PMF) THE DISCHARGE RATING CURVE GIVES

ELVN = 978.05

FROM STAGE-STORAGE CURVE FOR THIS ELVN

STORAGE ≅ 52 AC.FT.

$STOR_i = \frac{52 \times 12}{0.27 \times 140} = 3.6''$ OF RUN-OFF

$QP_i = QI_i \left(1 - \frac{STOR_i}{9\frac{1}{2}}\right)$

① STOR$_i$ INCHES	② $1 - \frac{STOR_i}{9\frac{1}{2}}$	③ STOR-AC-FT ① $\times \frac{0.27 \times 140}{12}$	④ QI$_i$ CFS ② $\times$ 350	⑤ ELVN FROM STORAGE CURVE USING ③
2.75	0.71	40	249	977.35
3.25	0.66	47	231	977.75
3.6	0.62	52	217	978.05

COLUMNS ④ & ⑤ ARE PLOTTED ON DISCHARGE RATING CURVE AND

PEAK OUTFLOW Q = 240 CFS

MAXIMUM STAGE = 977.55

TOP OF DAM = 978.5

∴ THE DAM IS NOT OVERTOPPED IN THE PMF

1H. ROUTING IS DONE FOR 100YR FLOOD ALSO.

100YR PEAK INFLOW $= \frac{5}{19} \times 700$ CFS $\cong 200$ CFS
(100YR FLOOD WOULD RESULT FROM 5" R.O FROM 0.27 SQ. MILES D.A.)

DETERMINATION OF PEAK OUTFLOW -
FOR 200 CFS (100YR) THE DISCHARGE RATING CURVE
GIVES ELEVN = 977.35 AND

FROM STAGE STORAGE CURVE FOR THIS ELVN
STORAGE = 40 AC.FT.

$STOR_i = \frac{40 \times 12}{0.27 \times 140} = 2.8$" OF RUN-OFF

$Q_{P_i} = Q_{P_1}\left(1 - \frac{STOR_i}{5}\right)$

① STOR$_i$ INCHES	② $1 - \frac{STOR_i}{5}$	③ STOR$_i$ AC.FT. $\frac{① \times 0.27 \times 140}{12}$	④ Q_{P_i} CFS ② × 200	⑤ ELVN FROM STORAGE CURVE VS ③
2.00	0.6	29	120	976.75
2.25	0.55	32	110	976.85
2.5	0.5	36	100	977.1
2.8	0.44	40	88	977.35

COLUMN ⑤ GIVES THE VALUES ON DISCHARGE RATING CURVE AND

PEAK OUTFLOW Q = 112 CFS
MAXIMUM STAGE = 976.86
TOP OF DAM = 978.3

∴ THE DAM IS NOT OVERTOPPED IN 100YR FLOOD.

BREACH ANALYSIS - DOWNSTREAM FAILURE HAZARD
(INITIAL BREACH ANALYSIS WAS PERFORMED FOR Y_o TO TOP OF DAM)
BREACH OUTFLOW $Q_b = \frac{8}{27} \times W_b \times \sqrt{g} \times Y_o^{3/2}$
HEIGHT AT TIME OF FAILURE $Y_o = 26.25'$
(Y_o IS TAKEN TO THE MAXIMUM POOL ELEVATION 177.55)
BREACH WIDTH W_b = 40% OF MID HEIGHT LENGTH OF DAM
MIDHEIGHT LENGTH = 390' (ESTIMATED FROM USGS MAP AND FIELD OBSERVATIONS)
W_b = 40% OF 390 = 156'
$Q_b = \frac{8}{27} \times \sqrt{32.2} \times (26.25)^{3/2} \times 156$ = 35,250 CFS

PEAK FAILURE OUTFLOW (Q_{PF}) = Q_b + NORMAL SPILLWAY & ABUTMENT DISCHARGES = 35,250 + 240 = 35,490, USE 36,000 CFS

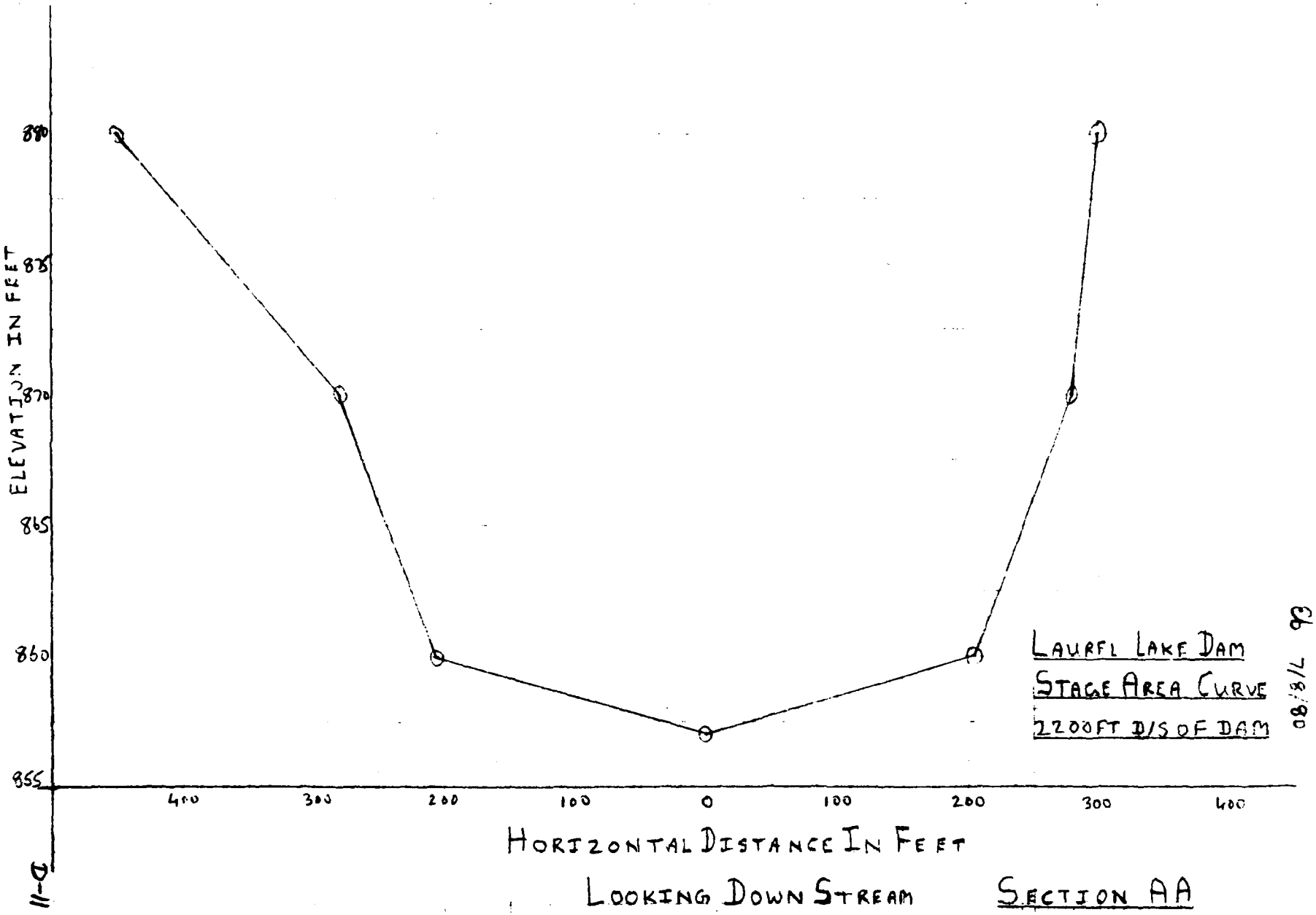
ESTIMATED FAILURE FLOOD DEPTH = 0.44 Y_o = 0.44 × 26.25 ≈ 12 FT.

PERFORM DAM BREAK ROUTING OF PEAK FAILURE OUTFLOW
THE REACH BETWEEN THE DAM AND THE SOUTHERN EDGE OF THE SWAMP IS OPEN AND NARROW FOR THE LAST PART. IT IS ASSUMED THAT ANY ATTENUATION OF THE FLOOD VOLUME IN THIS REACH WOULD BE VERY SMALL. NEGLECTING ATTENUATION IN THIS REACH, FLOOD ROUTING IS DONE THROUGH THE LARGE SWAMP.

SELECT A SECTION AA 650' D/S OF SOUTHERN EDGE OF THE SWAMP
(SECTION AA IS 2200' D/S OF THE DAM) MANNING EQUATION
$Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$ n = 0.06 ASSUMED
$= 1.17 \times A \times R^{2/3}$ S = 0.004

ELV	AREA FT²	P	R = A/P	$R^{2/3}$	Q CFS
857	0	—	—	—	—
860	615	410	1.5	1.3	900
865	2845	493	5.77	3.2	10,650
870	5415	571	9.57	4.5	29,000
872	6623	600	11.10	5	39,000

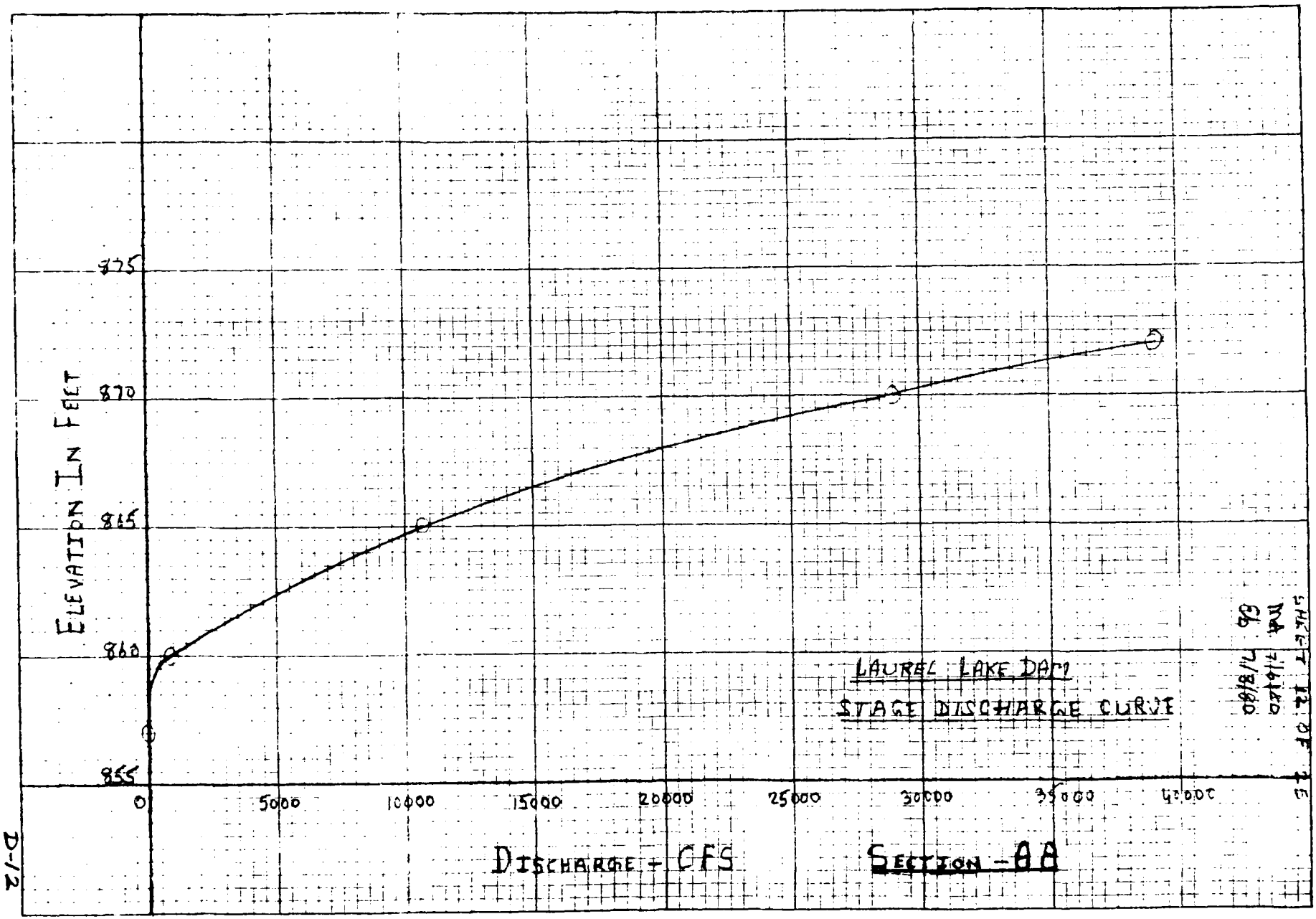
STAGE-AREA AND STAGE DISCHARGE CURVES ARE PLOTTED



LAUREL LAKE DAM
STAGE AREA CURVE
2200FT D/S OF DAM

SHEET 11 OF 25
MM 7/16/80
08/7/80

D-11



STORAGE TO MAX^{M} POOL = 44 + 118 = 162 AC.FT.

FOR QP_1 = 36,000 CFS, ELVN = 871.5 AND FROM STAGE AREA CURVE, AREA = 6354 SQ.FT.

VOLUME OF REACH $V_1 = \frac{650 \times 6354}{43,560} = 95$ AC.FT.

ESTIMATED STORAGE TO BE ATTENUATED = 162 AC.FT. (AT MAX^{M} POOL)

TRIAL $QP_2 = QP_1\left(1 - \frac{V_1}{S}\right) = 36,000\left(1 - \frac{95}{162}\right) \cong 15,000$ CFS

FOR 15,000 CFS, ELVN = 866.5 AND AREA = 3605 SQ.FT.

$V_2 = \frac{650 \times 3605}{43,560} = 54$ AC.FT

RECOMPUTING $QP_2 = 36,000\left(1 - \frac{\frac{95+54}{2}}{162}\right) \cong 19,500$ CFS

AND FLOOD STAGE = 867.8

∴ DEPTH OF FLOOD WATER = 867.8 − 857 ≅ 10.8FT AT SECTION AA

VELOCITY AT SECTION AA $= \frac{19,500}{4281} = 4.6$ FPS

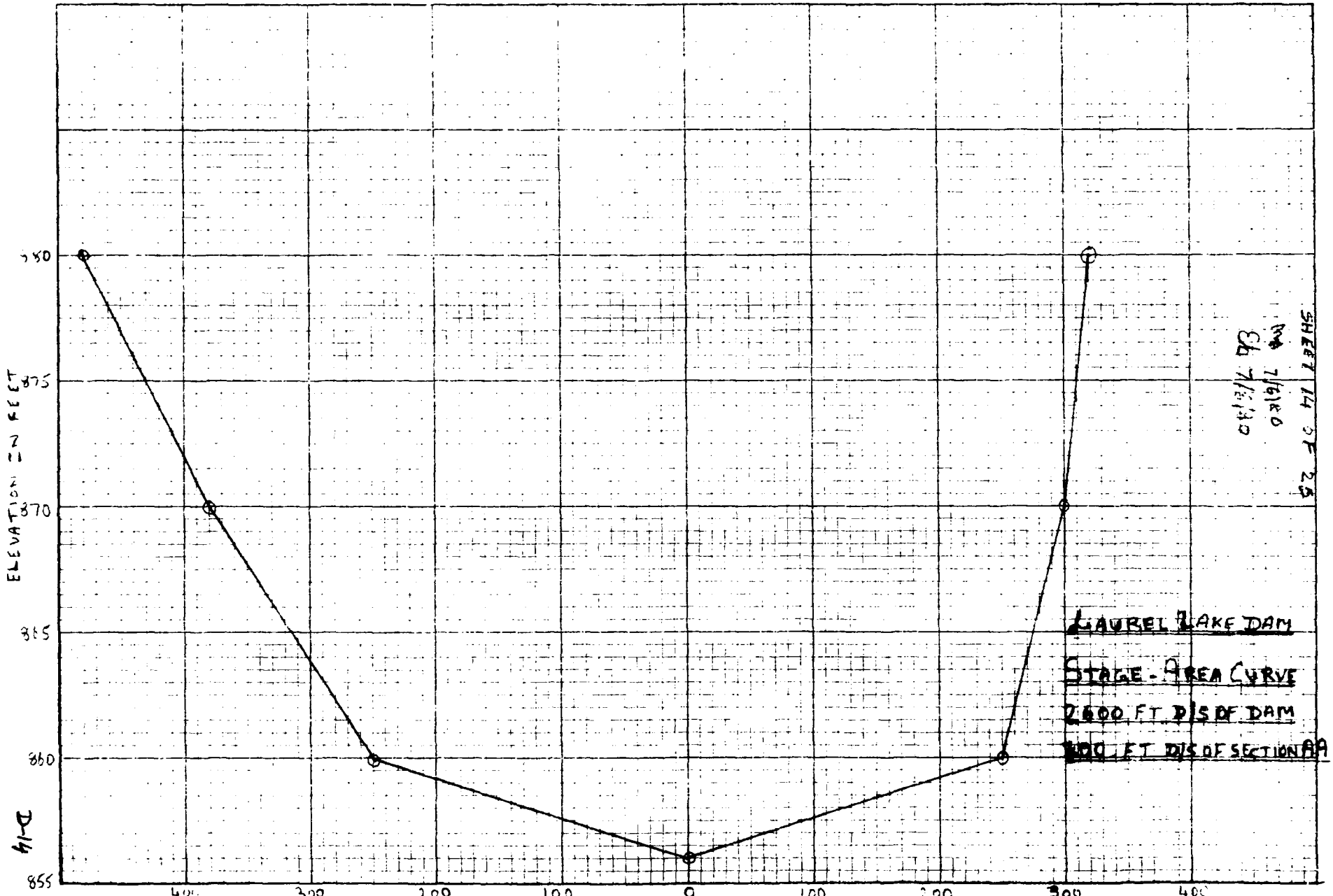
SELECT SECTION BB 400' D/S OF AA

$Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$
$= 117 \times A \times R^{2/3}$

n = 0.08 ASSUMED
S = 0.004 ESTIMATED FROM USGS MAP.

EL	A SQ.FT.	P	R = A/P	$R^{2/3}$	Q CFS
856	0	—	—	—	—
860	1000	500	2	1.59	18 00
865	3725	590	6.31	3.42	14,900
870	6900	681	10.1	4.69	37,850

STAGE AREA AND STAGE DISCHARGE CURVES ARE PLOTTED.



SHEET 14 OF 25

Ck 7/6/80

Ck 7/6/80

LAUREL LAKE DAM

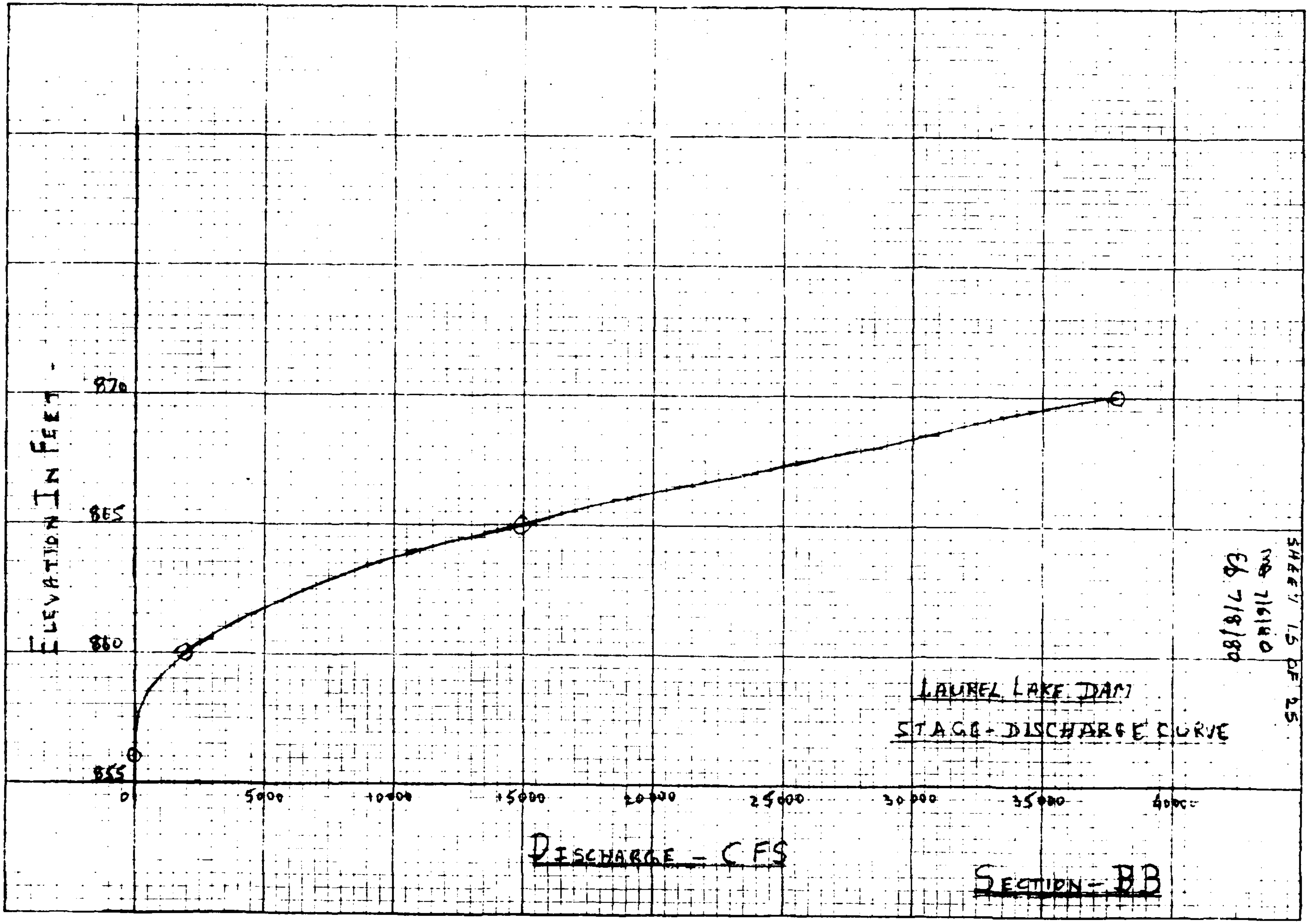
STAGE - AREA CURVE

2600 FT D/S OF DAM

300 FT D/S OF SECTION AA

SECTION - BB

D-14



FOR Q_{P_1} = 19,500 CFS, ELVN = 866.2 AND FROM STAGE-AREA CURVE, AREA = 4441 SQ.FT

VOLUME OF REACH $V_1 = \frac{400 \times 4441}{43,560}$ = 41 AC.FT.

STORAGE REMAINING = $162 - \frac{95+54}{2}$ = 88 AC.FT.

TRIAL $Q_{P_2} = Q_{P_1}\left(1 - \frac{V_1}{S}\right) = 19,500\left(1 - \frac{41}{88}\right) \cong 10,500$ CFS

FOR 10,500 CFS, ELVN = 863.9 AND AREA = 3086 SQ.FT.

$V_2 = \frac{400 \times 3086}{43,560}$ = 28 AC.FT.

RECOMPUTING $Q_{P_2} = 19,500\left(1 - \frac{41+28}{2}/88\right) \cong 12,000$ CFS

AND FLOOD STAGE = 864.3

∴ DEPTH OF FLOOD WATER = 864.3 − 856 = **8.3 FT** AT SECTION BB

VELOCITY AT SECTION BB = $\frac{12,000}{3313}$ = **3.6 FPS**

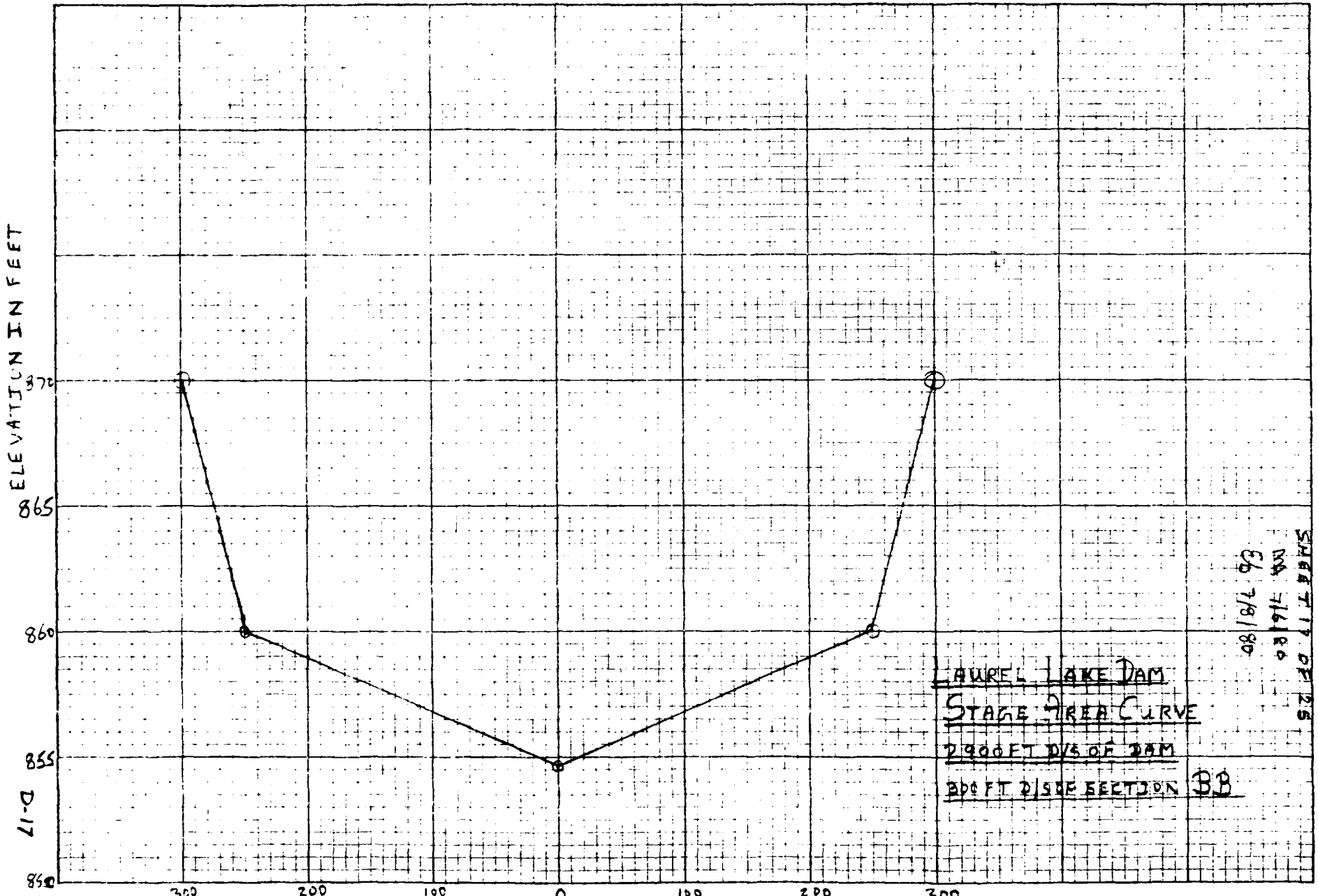
SELECT A SECTION CC 300 FT. D/S OF SECTION BB

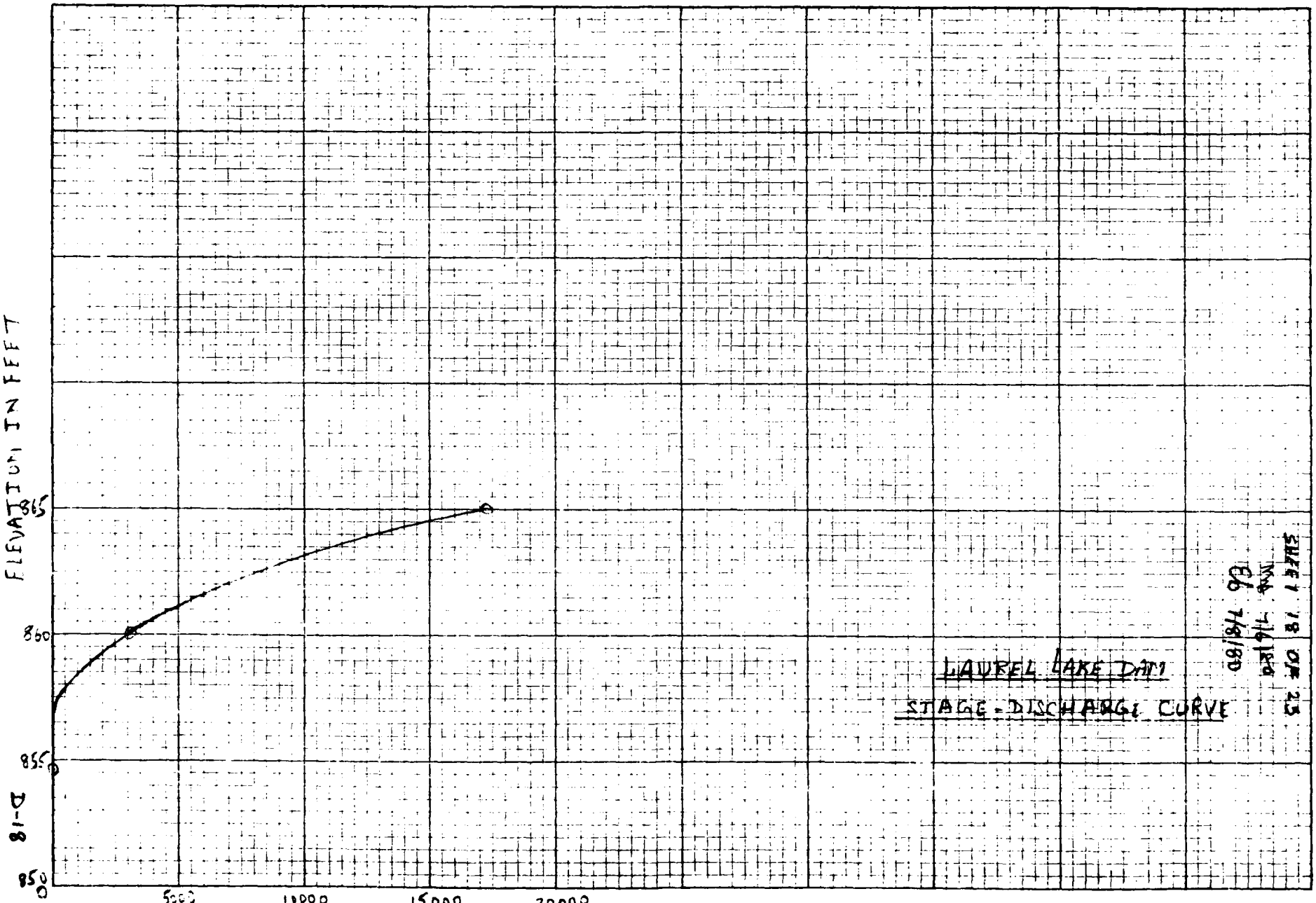
$Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2} = 1.17 \times A \times R^{2/3}$

n = 0.08 ASSUMED
S = 0.004 ESTIMATED FROM USGS MAP

EL	A. SQ.FT	P	R = A/P	$R^{2/3}$	Q CFS
854.6	0	—	—	—	—
860	1350	500	2.7	1.94	3100
865	3975	551	7.21	3.72	17,300

STAGE AREA AND STAGE-DISCHARGE CURVES ARE PLOTTED





LAUREL LAKE DAM
STAGE - DISCHARGE CURVE

SHEET 18 OF 23
MM 7-7-69
EG 7/8/69

SECTION C C

FOR QP_1 = 12,000 CFS, ELVN = 863.8 AND FROM STAGE AREA CURVE, AREA = 3322 SQ.FT.

VOLUME OF REACH $V_1 = \frac{300 \times 3322}{43,560} = 23$ AC.FT.

STORAGE REMAINING $= 88 - \frac{41+28}{2} = 54$ AC.FT.

TRIAL $QP_2 = QP_1\left(1 - \frac{V_1}{S}\right) = 12,000\left(1 - \frac{23}{54}\right) = 7,000$ CFS

FOR 7,000 CFS, ELVN = 862.0 AND AREA = 2370

$\therefore V_2 = \frac{300 \times 2370}{43,560} = 16$ AC.FT.

RECOMPUTING $QP_2 = 12,000\left(1 - \frac{\frac{23+16}{2}}{54}\right) = 7,700$ CFS

AND FLOOD STAGE = 862.3

$\therefore$ DEPTH OF FLOODWATER = 862.3 − 854.6
= 7.7 FT AT SECTION CC

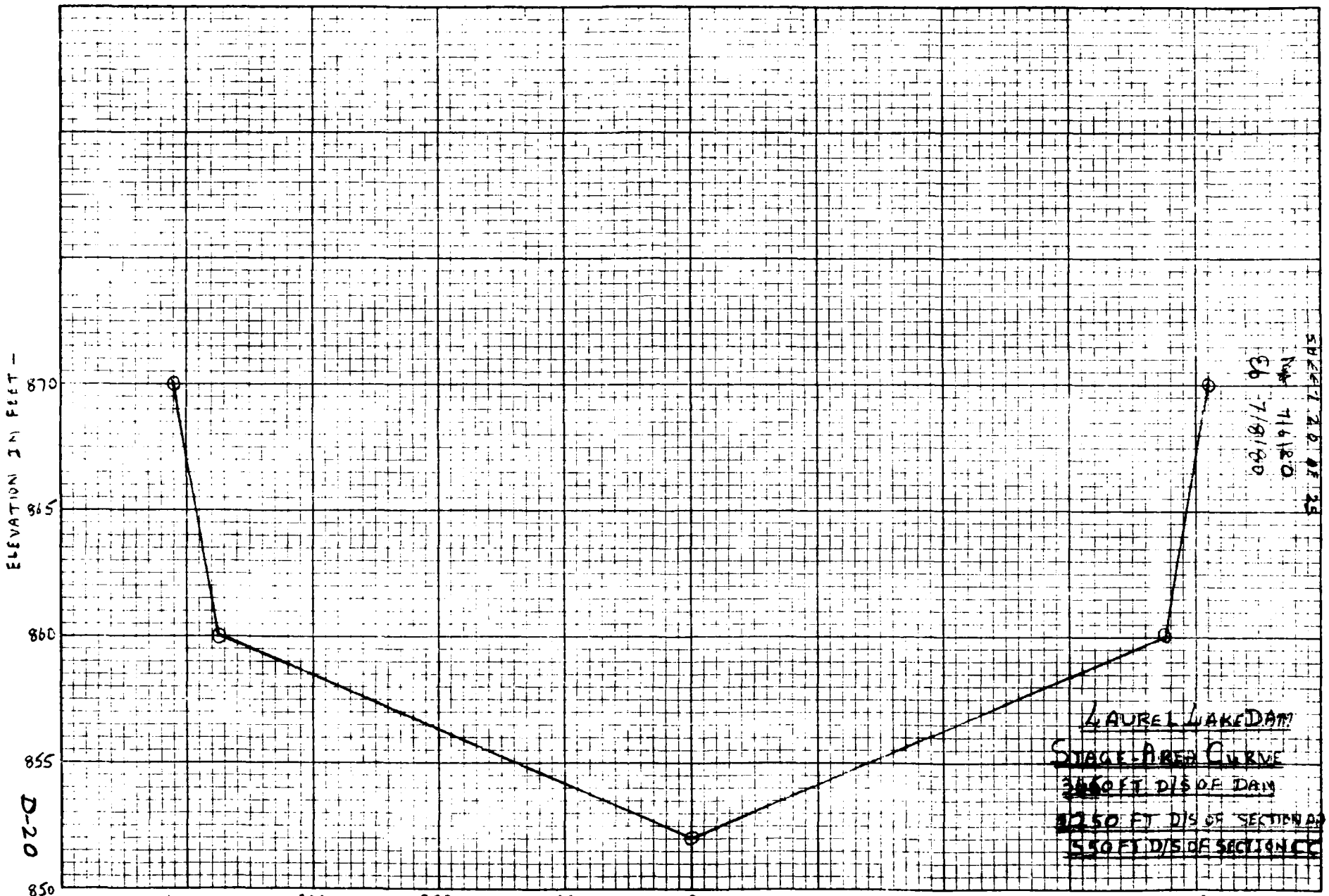
VELOCITY AT SECTION CC $= \frac{7700}{2525} = 3.0$ FPS

SELECT A SECTION DD 550 FT D/S OF SECTION CC

$Q = \frac{1.486}{n} \times A \times R^{2/3} \times S^{1/2}$ n = 0.08 ASSUMED
$= 1.17 \times A \times R^{2/3}$ S = 0.004 ESTIMATED FROM USGS MAP.

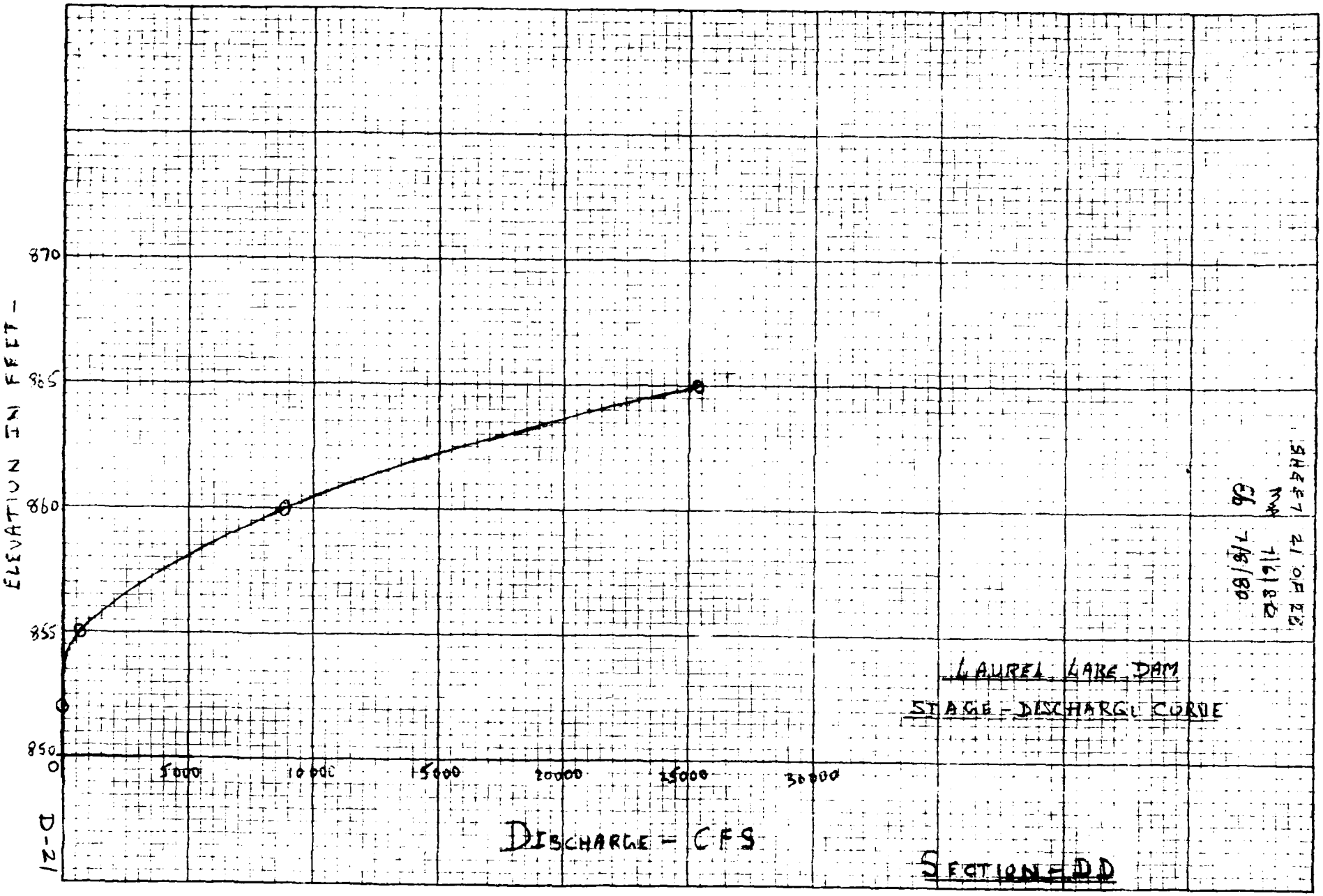
EL.	A-SQ.FT.	P	R = A/P	$R^{2/3}$	Q CFS
852	0	—	—	—	—
855	420	280	1.5	1.31	650
860	2495	750	3.99	2.51	8,800
865	5740	784	7.32	3.77	25,300
870	8670	820	10.57	4.81	48,800

STAGE AREA AND STAGE-DISCHARGE CURVES ARE PLOTTED.



SECTION - DD

D-20


ELEVATION IN FEET -
870
865
860
855
850
0
5000
10000
15000
20000
25000
30000
DISCHARGE - CFS
LAUREL LAKE DAM
STAGE - DISCHARGE CURVE
SECTION - DD
SHEET 21 OF 22
7/8/80
D-21

FOR QP_1 = 7,700 CFS, ELVN = 859.5 AND FROM STAGE-AREA CURVE, AREA = 2618 SQ.FT.

VOLUME OF REACH $V_1 = \frac{550 \times 2618}{43,560}$ = 33 AC.FT

STORAGE REMAINING = $54 - \frac{23+16}{2} \cong 35$ AC.FT.

TRIAL $QP_2 = QP_1 \left(1 - \frac{V_1}{S}\right) = 7,700 \left(1 - \frac{33}{35}\right)$ = 440 CFS

FOR 440 CFS, ELVN = 854.7 AND AREA = 350 SQ.FT

$V_2 = \frac{550 \times 350}{43,560}$ = 4 AC.FT.

RECOMPUTING $QP_2 = 7,700 \left(1 - \frac{\frac{33+4}{2}}{35}\right)$ = 3,700 CFS

AND FLOOD STAGE = 857.4

DEPTH OF FLOOD WATER = EL 857.4 − 852
= 5.4 FT AT SECTION DD

VELOCITY AT SECTION DD = $\frac{3,700}{1490} \cong$ 2.5 FPS.

FAILURE HAZARD POTENTIAL

SUMMARY OF BREACH ANALYSIS RESULTS—

LOCATION	DISTANCE FROM DAM FT	PEAK FLOW RATE CFS	FLOOD STAGE	FLOOD DEPTH FT.	VELOCITY FPS
DAM	0	36,000	963.3	12	—
AA	2200	19,500	867.8	10.8	4.6
BB	2600	12,000	864.3	8.3	3.6
CC	2900	7,700	862.3	7.7	3.0
DD	3450	3,700	857.4	5.4	2.5

THE SWAMP, WHICH IS 1550± FT. DOWNSTREAM OF THE DAM, ATTENUATES NEARLY 90% OF THE FLOOD VOLUME, AND AT THE NORTHERN EDGE OF THE SWAMP, THE FLOOD DEPTH IS ESTIMATED TO BE 5.4± FT. WITH 2.5 FPS VELOCITY AND A PEAK FLOW RATE OF 3,700 CFS. THE BSULLAK ROAD AT THE NORTHERN EDGE OF THE SWAMP COULD BE INUNDATED WITH 3.4± FT. OF WATER, AND ONE HOUSE NORTH OF THE ROAD, SITUATED 4± FT. ABOVE THE EDGE OF THE SWAMP IS EXPECTED TO BE FLOODED BY 1.4± FT OF WATER.

FURTHER DOWNSTREAM, THE 3 FT CULVERT ON EAST WEST HILL ROAD COULD ALSO BE IMPACTED. BECAUSE OF INADEQUATE CAPACITY. IT IS NOTED

THAT THE IMPACT ANALYSIS IS DONE BASED ON ASSUMPTION THAT THE FLOOD WATER WOULD TRAVEL IN THE DIRECTION OF THE HOUSE, WHICH IS LOCATED ADJACENT TO THE REPORTED ORIGINAL STREAM OUTLETTING FROM THE SWAMP. APPARENTLY, THE CULVERT FOR THIS STREAM WAS BLOCKED AFTER A PREVIOUS SERIOUS FLOODING WHEN THE DRIVEWAY OF THE HOUSE WAS INUNDATED AND DAMAGED. IT IS REPORTED THAT AFTER THIS FLOODING, A CULVERT WAS BUILT AT THE NORTHWESTERN END OF THE SWAMP AND THE DIRT ROAD WAS PAVED OVER.

THUS, BASED UPON ABOVE ANALYSIS, A HAZARD POTENTIAL OF SIGNIFICANT MAGNITUDE IS CONSIDERED LIKELY.

SUMMARY- HYDRAULIC/HYDROLOGIC COMPUTATIONS

TEST FLOOD PEAK INFLOW ½ PMF — 350 CFS
(PARALLEL COMPUTATIONS HAVE BEEN PERFORMED FOR 100YR PEAK INFLOW AND RESULTS ARE SUMMARIZED BELOW)

PERFORMANCE AT PEAK FLOOD CONDITIONS:	½ PMF	100 YR
PEAK INFLOWS CFS	350	200
PEAK OUTFLOWS CFS	248	112
SPILL.CAP.TO TOP OF DAM(EL.978.3NGVD) CFS	410	410
SPILL.CAP.TO TOP OF DAM % OF PEAK OUTFLOW	170	366
SPILL.CAP. TO PEAK FLOOD ELVN. CFS	240	112
SPILL. CAP. TO PEAK FLOOD ELVN. %OF PEAK OUTFLOW	100	100

PERFORMANCE:		
MAXIMUM POOL ELEVATION NGVD	977.55	976.86
MAX. SURCHARGE HEIGHT ABOVE SPILL.CREST	FT. 2.55	1.86
NON-OVERFLOW SECTION OF THE DAM OVERTOPPED	NO	NO

DOWNSTREAM FAILURE CONDITIONS:
PEAK FAILURE OUTFLOW CFS — 36,000
FLOOD DEPTH IMMEDIATELY D/S FROM DAM — 12 FT
CONDITIONS AT THE INITIAL IMPACT AREA:
ESTIMATED STAGE BEFORE FAILURE WITH 248 CFS — 854.5NGVD
ESTIMATED STAGE AFTER FAILURE WITH 3700 CFS — 857.4NGVD
ESTIMATED RAISE IN STAGE AFTER FAILURE ΔY_1 — 2.9FT

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

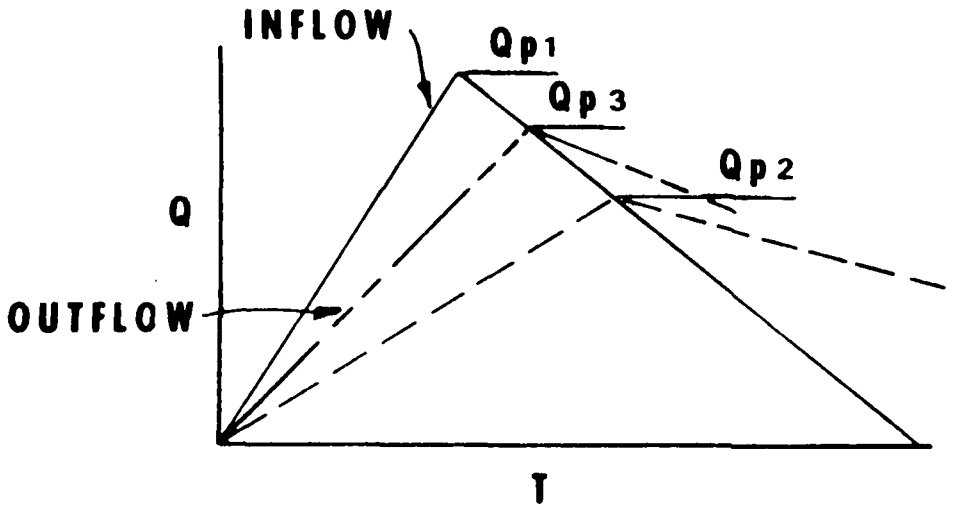
MAXIMJM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS BASED ON TWICE THE STANDARD PROJECT FLOOD (Flat and Coastal Areas)

	River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1.	Pawtuxet River	19,000	200	190
2.	Mill River (R.I.)	8,500	34	500
3.	Peters River (R.I.)	3,200	13	490
4.	Kettle Brook	8,000	30	530
5.	Sudbury River.	11,700	86	270
6.	Indian Brook (Hopk.)	1,000	5.9	340
7.	Charles River.	6,000	184	65
8.	Blackstone River.	43,000	416	200
9.	Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

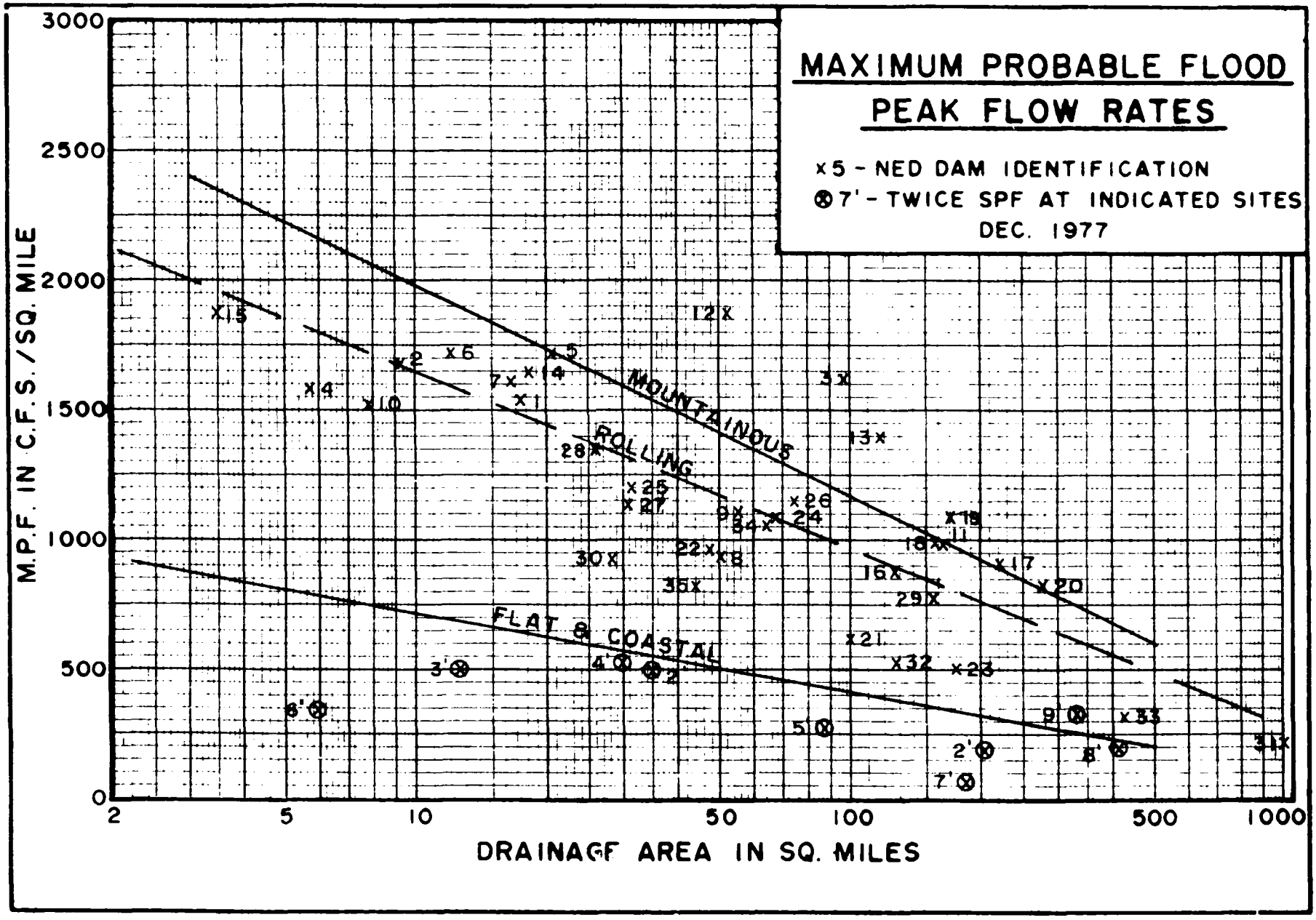
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

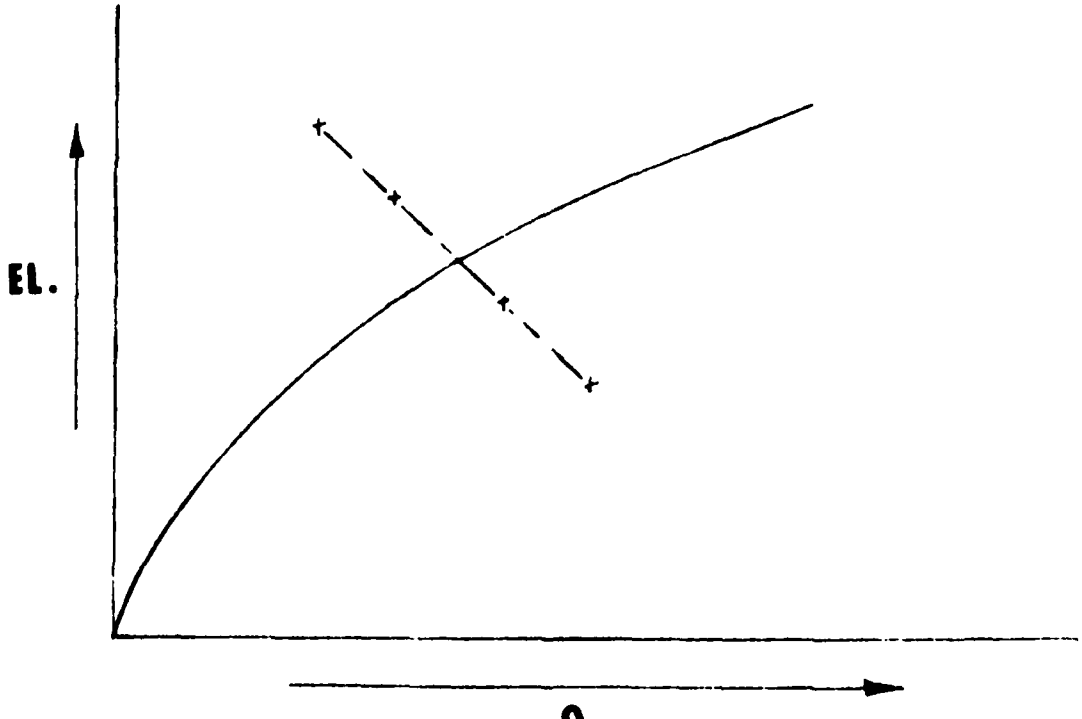
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

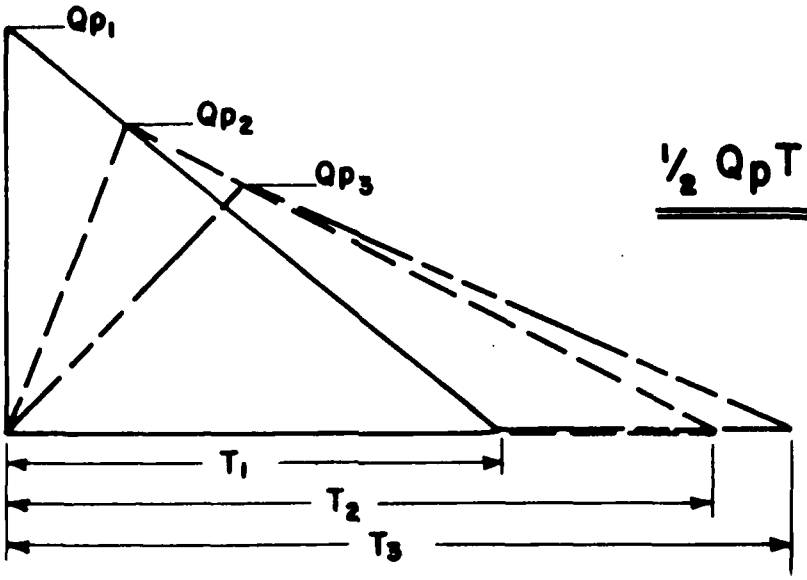
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19" R.O.

Q_{p2}	STOR	EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Q_{p_2}(\text{TRIAL}) = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_{ave}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

FILMED

DTIC